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THE
TRICHOPTERA
(*CADDIS-FLIES*)
OF AUSTRALIA AND NEW ZEALAND

BRITISH MUSEUM (NATURAL HISTORY)

THE TRICHOPTERA

(*CADDIS-FLIES*)

OF

AUSTRALIA AND NEW ZEALAND

DESCRIBED AND FIGURED BY

MARTIN E. MOSELY

AND

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LONDON

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PREFACE.

It is probably true to say that this work owes its origin to the generous gifts of Trichoptera made over a long period of years by the late G. V. Hudson, who for more than half a century was the principal figure in New Zealand entomological circles. It had not progressed very far, however, when in 1938 the Trustees were so fortunate as to acquire the very extensive collections formed by the distinguished trichopterist Robert McLachlan during the latter half of the nineteenth century. In the same year Mrs. Tillyard presented to the Trustees the collection of Trichoptera from Australia and New Zealand that had been made by her husband, Dr. R. J. Tillyard, who died in tragic circumstances in 1936. These two important acquisitions gave further stimulus to the project, and by greatly enriching the material available for study, enabled the authors to expand its scope and, it is hoped, its usefulness.

Hitherto Australian and New Zealand entomologists have been hampered in their work on the Trichoptera by the fact that the types of the species described by McLachlan and Walker were in England, and that many of the original descriptions were not readily available to them. It has been the authors' object in this work to minimise as far as possible these handicaps by re-describing and re-figuring all the type specimens available to them, and reprinting the older descriptions and reproducing the descriptions and figures of those species of which they had no actual material. The descriptions had been nearly completed by Mr. Mosely at the time of his death in 1948. All the illustrations are by Mr. Kimmins, who has also drawn up the remaining descriptions, provided the necessary framework of text, added the introduction, and prepared all the keys. Nevertheless, the matter might well have remained there had it not been that, acting on the recommendations of their scientific advisers, both the Australian and New Zealand Governments offered generous financial help towards the cost of publication. For this the Trustees are extremely grateful.

British Museum (Natural History)

N. D. RILEY,
Keeper,
Department of Entomology.

London
28th August 1952.

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THE TRICHOPTERA OF AUSTRALIA AND NEW ZEALAND

I. INTRODUCTION

BY

D. E. KIMMINS.

1. HISTORY OF THE WORK.

The present work was commenced some time before the outbreak of the Second World War in 1939, and about half of the total number of species had already been described and figured when evacuation of part of the British Museum entomological collections (necessitating my transfer to the country), and subsequently, my absence on military service, compelled Mr. Mosely to suspend operations on this fauna. In 1947 we were able to resume work, and the greater part of the actual descriptive matter had been completed when my colleague died. Although this publication appears under our joint names, it should be clearly understood that all new family, generic and specific names are to be credited to Mosely unless otherwise indicated by my name being appended in brackets. Any major alterations or additions to his completed text are enclosed in square brackets and are accompanied by my initials. I am also responsible for all the keys, most of the family diagnoses, comparisons of species and for this introduction. Unless otherwise indicated, the types of all new species are in the British Museum (N.H.).

2. ACKNOWLEDGMENTS.

Our grateful acknowledgments and thanks are due to all who have so willingly helped with gifts and loans of material and with advice. In particular, our thanks are due to the late Mr. G. V. Hudson, whose generous gifts of New Zealand Trichoptera (and indeed of many Neuropteroid insects, in the broad sense) have done so much to enrich our collections; to the late Dr. R. J. Tillyard for the bequest to the British Museum of his collections of Australian and New Zealand Trichoptera, etc., which formed the basis of his work and of our own on the fauna of New Zealand and Australia; to Dr. J. W. Evans for his gifts of Tasmanian Trichoptera; to the Council for Scientific and Industrial Research, Canberra, for the loan of material for study; to Dr. G. Ulmer, whose help and advice has always been so freely given, and who has contributed

to this work the description of the larva of *Philanisus plebeius* Walker ; and finally to our colleagues in this Museum, whose suggestions and advice have helped much in the production of this work.

3. SCOPE OF THE WORK, AND DISCUSSION OF THE FAUNA.

The geographical boundaries adopted for this work are the Australian Continent, the island of Tasmania and the North and South Islands of New Zealand. From a strict zoo-geographical standpoint, one should either include the whole of the Austro-Oriental sub-region or else exclude Queensland and the Northern Territory. To have adopted the first course would have extended vastly the scope and size of this work, far beyond that envisaged by Mosely, and it was decided to accept the admittedly artificial boundaries outlined above, rather than to exclude those parts of Australia which fall within the Austro-Oriental sub-region.

When this work was first contemplated, the Trichopterous fauna of New Zealand was comparatively better known than that of the Australian Continent, due in no small measure to the labours of that excellent collector and entomologist, Mr. G. V. Hudson, and to the work of Dr. R. J. Tillyard and, more recently, to that of Mr. A. G. McFarlane. In Tillyard's book, *Insects of Australia and New Zealand* (1926), the total number of species of New Zealand Trichoptera is given as 47. McFarlane in 1939 added 8 more species, and in the present work the total is raised to 76 species, in 33 genera.

For Australia and Tasmania, Tillyard quotes 58 as the total number of species, but as this figure includes a number of undescribed species in his own collection, the actual total of described species in 1926 was probably nearer 40. The Australian total dealt with in this work is 177 species, in 69 genera, and one can only regard this as a beginning. The authors are fully conscious that this work is only an outline upon which later workers will be able to fill in a more complete picture of the fauna, particularly as regards the Australian Continent. Systematic collecting will certainly bring to notice many more species, since the figure of 177 species is ridiculously low for a continent the size of Australia, with its varied climates and habitats. One has only to compare this figure with the total of Trichoptera occurring in the British Isles (188 species) to realize how much remains to be done.

Altogether 90 genera and 250 species* are dealt with here, of which 23 genera and 113 species are described as new. In addition, three new families are proposed, two to take known genera and one for a new genus. Of the total number of genera, 66 are restricted to the Australasian region, and of these, 42 are endemic to the Australian Continent and Tasmania, 14 to Australia only, 5 to Tasmania only and 19 to New Zealand. There appear to be few genera with a purely Antarctic distribution, but this fact may be partly due to our insufficient knowledge of the Trichopterous fauna of the Chilean sub-region.

In Australia, the dominant family of Trichoptera (as far as number of species is concerned) is the *Leptoceridae*. This dominance is due in part to a

* McFarlane's 1951 papers bring this total to 261 (see p. 532).

TABLE A.—*A comparison of the Number of Species of Trichoptera Occurring in the Australian and Austro-Oriental Sub-regions of the Australian Continent and Tasmania.*

	Australian.		Austro-Oriental.		Common to both.	
PLECTROTARSIDAE	3					
Plectrotarsus		3				
LIMNEPHILIDAE	1					
Archaeophylax		1				
SERICOSTOMATIDAE	23		1			
Coenoria		1				
Matasia		1				
Hampa		1				
Costora		3				
Antipodoecia		1				
Tamasia		1				
Caenota		..		1		
Tismana		1				
Helicopsyche		4				
Saetotricha		1				
Conoesucus		3				
Lingora		3				
Tasimia		3				
PHILANISIDAE	1					
Philanisus		1				
BERAEIDAE	2					
Alloecella		2				
MOLANNIDAE	1					
Molanniella		1				
HELICOPHIDAE	2					
Helicopha		2				
ODONTOCERIDAE	9					
Caloca		4				
Barynema		2				
Marilia		2				
Atriplectides		1				
CALAMOCERATIDAE	1		3		1	
Anisocentropus		1		3		1
PHILORHEITHRIDAE	5					
Tasmanthrus		1				
Aphilorheithrus		1				
Austrheithrus		2				
Kosrheithrus		1				
LEPTOCERIDAE	41		18		10	
Triplectides		12		8		5
Triplexa		..		1		
Triplexina		1				
Triplectidina		1				
Hudsonema		2				
Notalina		6				
Symphitoneuria		2		1		

TABLE A.—(*cont.*).

	Australian.	Austro-Oriental.	Common to both.
LEPTOCERIDAE			
Lectrides	1		
Leptorussa	2	1	1
Triaenodes	1	1	1
Leptocerus	1	2	1
Oecetis	12	4	2
HYDROPSYCHIDAE	15	9	2
Macronemum	3	2	
Cheumatopsyche	1	1	1
Smicridea	3	1	
Asmicridea	2	1	1
Diplectrona	4	3	
Sciops	1	1	
Austropsyche	1		
POLYCENTROPODIDAE	6	4	
Plectrocnemia	1		
Nyctiophylax		2	
Polyplectropus	1		
Stenopsychodes	4	2	
PSYCHOMYIDAE	5	1	1
Ecnomus	2	1	1
Ecnomina	3		
PHILOPOTAMIDAE	7	3	1
Hydrobiosella	5	1	
Chimarra	2	2	1
RHYACOPHILIDAE	16	6	2
Ulmerochorema		1	
Taschorema	4	3	2
Notiobiosis	1	1	
Anachorema	4		
Austrochorema	1		
Allobiosis	1		
Psyllobetina	1		
Allochorema	1		
Bachorema	1	1	
Agapetus	1		
Synagapetus	3		
HYDROPTILIDAE	3	5	
Hydroptila	1	2	
Orphninotrichia	1		
Xuthotrichia	1	3	
	141	50	17

strong Austro-Oriental element in this family (about 40%), particularly in the genus *Triplectides*, in which more than half of the Australian species occur in Queensland or North Territory, and a third are restricted to that region. Following the *Leptoceridae*, the *Sericostomatidae* and *Rhyacophilidae* come next

in abundance of species, the former having practically no representatives at present recorded from the Austro-Oriental part of the continent. Table A shows the number of species occurring in the Austro-Oriental and Australian sub-regions of the continent.

In comparison, the New Zealand fauna is a rather impoverished one, seven of the families which occur in Australia being entirely unrepresented in New

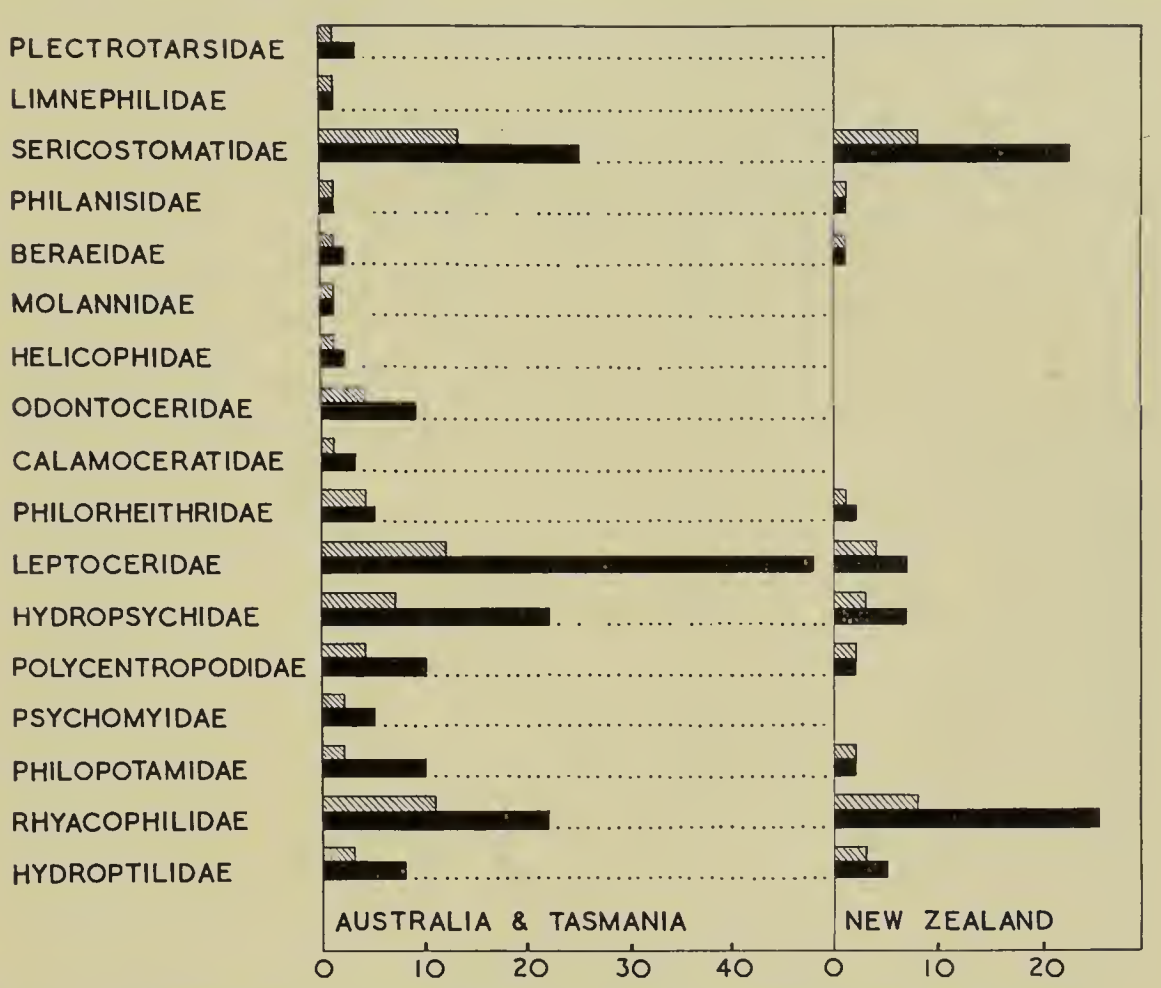

FIG. 1.—A comparison of the trichopterous fauna of Australia and New Zealand, expressed in terms of the number of genera and species. Genera shown shaded, species in solid.

Zealand. The *Leptoceridae* have but few species, and the first place is taken by the *Rhyacophilidae*, closely followed by the *Sericostomatidae*. These two families are each represented by nearly as many species as the rest of the New Zealand families combined. The New Zealand Trichoptera show a high degree of specific endemism, and it is interesting to note that of the three species common to Australia and New Zealand, two of them are closely related species of *Triplectides*, one of which has a range extending to India, China and Japan, and the third species is the only known marine Caddis-fly, *Philanisus plebeius*

Walker. A comparison of the Trichopterous faunas of Australia and New Zealand, in terms of the number of genera and species in the various families, is set out graphically in fig. 1, and a further analysis, showing in addition the number of genera and species common to both Australia and New Zealand, is given in Table B.

TABLE B.—*An Analysis of the Trichoptera of Australia and New Zealand, in Terms of Number of Genera and Species in Each Area and Common to Both Areas.*

	Australia and Tasmania.		New Zealand.		Australia and Tasmania only.		New Zealand only.		Common to both regions.		Totals.	
	gen.	sp.	gen.	sp.	gen.	sp.	gen.	sp.	gen.	sp.	gen.	sp.
PLECTROTARSIDAE	1	3	..	..	1	3	..	..	..	..	1	3
LIMNEPHILIDAE	1	1	..	..	1	1	..	..	..	..	1	1
SERICOSTOMATIDAE	13	25	8	23	12	25	7	23	1	..	20	48
PHILANISIDAE	1	1	1	1	..	..	..	..	1	1	1	1
BERAEIDAE	1	2	1	1	1	2	1	1	..	..	2	3
MOLANNIDAE	1	1	..	..	1	1	..	..	..	..	1	1
HELICOPHIDAE	1	2	..	..	1	2	..	..	..	..	1	2
ODONTOCERIDAE	4	9	..	..	4	9	..	..	..	..	4	9
CALAMOCERATIDAE	1	3	..	..	1	3	..	..	..	..	1	3
PHILORHEITHRIDAE	4	5	1	2	4	5	1	2	..	..	5	7
LEPTOCERIDAE	12	48	4	7	8	46	..	5	4	2	12	53
HYDROPSYCHIDAE	7	22	3	7	5	22	1	7	2	..	8	29
POLYCENTROPODIDAE	4	10	2	2	2	10	..	2	2	..	4	12
PSYCHOMYIDAE	2	5	..	..	2	5	..	..	..	..	2	5
PHILOPOTAMIDAE	2	10	2	2	1	10	1	2	1	..	3	12
RHYACOPHILIDAE	11	22	8	26	10	22	7	26	1	..	18	48
HYDROPTILIDAE	3	8	3	5	3	8	3	5	..	..	6	13
Totals	69	177	33	76	57	172	21	73	12	3	90	250

The world distribution of the families of Trichoptera and of the genera represented in the Australian and New Zealand faunas is set out in table C.*

* The boundaries of the Austro-Oriental, Malaysian and Indo-Chinese sub-regions are those given by China, 1930, *Ins. Samoa*, **2** (3) : 85 and are as follows :

Austro-Oriental.—Lesser Sunda Isls., east of Wallace's Line, Celebes, Gilolo, Sula, Bouru, Ceram, Aru, New Guinea, N. Australia, Queensland, Bismarck Archipelago, Solomon Islands, New Hebrides, New Caledonia, Loyalty Islands.

Malaysian.—Malay Peninsula south of 10° N., Sumatra, Java, Bali, Borneo, Palawan and adjacent islands.

Indo-Chinese.– Southern slopes of Himalayas, Burma, Tenasserim, Assam, Siam, Cambodia, Cochin China, Laos, Annam, Tonkin, S. China, Hainan, Formosa.

TABLE C.—*World Distribution of the Families of Trichoptera and of the Genera Occurring in Australia and New Zealand.*

	Austra-lasian.					Oriental.					Afri-can.		Palaearctic.			American.			
	New Zealand.	Australian.	Tasmanian.	Polynesian.	Austro-Oriental.	Malaysian.	Philippines.	Indo-Chinese.	Indian.	Ceylonese.	Ethiopian.	Seychelles and Mascarene.	European and Siberian.	Mediterranean and Eremian.	Manchurian and Japanese.	Nearctic.	Neotropical.	Chilean.	Hawaiian Islands.
PHRYGANEIDAE						×		×					×	×	×	×		×	
PLECTROTARSIDAE		×	×																
Plectrotarsus		+	+																
LIMNEPHILIDAE		×	×					×					×	×	×	×		×	
Archaeophylax		+	+																
SERICOSTOMATIDAE	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	
Coenoria		+																	
Pycnocentria	+																		
Matasia			+																
Hampa		+																	
Costora			+																
Bcraeoptera	+																		
Antipodoecia		+																	
Tamasia		+	+																
Caenota		+		+															
Tismana			+																
Helicopsyche	+	+	+			+		+	+	+				+	+	+	+	+	
Saetotricha		+																	
Pycnocentrodes	+																		
Conoesucus		+	+																
Lingora		+	+																
Oeconesus	+																		
Pseudoeconesus	+																		
Zelandopsyche	+																		
Tasimia		+	+																
Olinga	+																		
PHILANISIDAE	×	×																	
Philanisus	+	+																	
BERAEIDAE	×	×									×		×	×		×			
Alloecella		+																	
Pycnocentrella	+																		
MOLANNIDAE		×				×		×		×			×		×	×			
Molaniella		+																	
HELICOPHIDAE		×	×																
Helicopha		+	+																
ODONTOCERIDAE		×	×					×		×		×	×	×	×	×	×	×	
Caloca		+	+																
Barynema		+																	

TABLE C.—(*cont.*).

	Australasian.					Oriental.					African.		Palaearctic.				American.			
	New Zealand.	Australian.	Tasmanian.	Polynesian.	Austro-Oriental.	Malaysian.	Philippines.	Indo-Chinese.	Indian.	Ceylonese.	Ethiopian.	Seychelles and Masearene.	European and Siberian.	Mediterranean and Eremian.	Manchurian and Japanese.	Nearctic.	Neotropical.	Chilean.	Hawaiian Islands.
ODONTOCERIDAE																+	+	+	
Marilia		+	+					+		+									
Atriplectides			+																
CALAMOCERATIDAE		×		×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	
Anisocentropus		+		+	+	+	+	+	+	+	+	+			+	+	+		
PHILORHEITHRIDAE	×	×	×																
Philorheithrus	+																		
Tasmanthrus			+																
Aphilorheithrus		+	+																
Austrheithrus		+	+																
Kosrheithrus		+																	
LEPTOCERIDAE	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	
Triplectides	+	+	+	+	+	+	+	+	+	+					+		+	+	
Triplexa					+														
Triplexina			+																
Triplectidina	+		+															+	
Hudsonema	+	+	+																
Notalina		+	+																
Symphitoneuria		+	+		+														
Leetrides			+																
Leptorussa		+	+		+														
Triaenodes		+			+	+		+	+	+	+	+	+	+	+	+	+		
Leptocerus		+			+	+	+	+	+	+	+	+	+	+	+	+	+		
Oecetis	+	+	+	+	+	+	+	+	+	+			+	+	+	+	+		
HYDROPSYCHIDAE	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	
Macronemum		+				+	+	+	+	+	+	+	+		+	+	+		
Hydropsyche	+					+	+	+	+	+	+	+	+	+	+	+	+		
Cheumatopsyche	+	+				+		+	+	+	+	+	+	+		+			
Smicridea		+				+													
Asmicridea		+	+			+													
Diplectrona	+	+	+			+	+	+	+	+			+	+	+	+			
Sciops		+				+													
Austropsyche		+																	
POLYCENTROPODIDAE	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	
Plectrocnemia	+	+	+			+			+	+		+	+	+	+	+	+		
Nyctiophylax						+			+	+		+					+		
Polyplectropus	+	+			+	+	+	+	+		+	+			+			+	
Stenopsychodes		+				+													

TABLE C.—(*cont.*).

	Austra-lasian.					Oriental.					African.		Palaearctic.			American.			
	New Zealand.	Australian.	Tasmanian.	Polynesian.	Austro-Oriental.	Malaysian.	Philippines.	Indo-Chinese.	Indian.	Ceylonese.	Ethiopian.	Seychelles and Mascarene.	European and Siberian.	Mediterranean and Eremian.	Manchurian and Japanese.	Nearctic.	Neotropical.	Chilean.	Hawaiian Islands.
PSYCHOMYIDAE		×	×		×	×	×	×	×	×	×	×	×	×	×	×	×	×	
Ecnomus		+	+		+	+	+	+	+	+	+	+	+	+					
Ecnomina		+	+																
PHILOPOTAMIDAE	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	
Hydrobiosella	+	+	+		+														
Zelobiosella	+																		
Chimarra		+		+	+	+	+	+	+	+	+	+	+			+	+	+	
RHYACOPHILIDAE	×	×	×	×	×	×	×	×	×	×	×		×	×	×	×	×	×	
Hydrobiosis	+																		
Psilochorema	+							?											
Ulmerochorema					+														
Taschorema		+	+		+														
Notiobiosis	+	+			+														
Anachorema		+	+																
Synchorema	+																		
Neurochorema	+																		
Costachorema	+																		
Austrochorema		+																	
Allobiosis		+																	
Psyllobetina		+			+														
Tiphobiosis	+																		
Allochorema			+																
Bachorema		+			+														
Agapetus		+				+	+	+		+			+	+		+			
Synagapetus		+	+					+					+		+	+			
HYDROPTILIDAE	×	×	×	×	×	×		×	×	×	×	×	×	×	×	×	×	×	×
Zelandoptila	+																		
Hydroptila			+		+			+			+		+	+		+	+		
Orphninotrichia		+																	
Oxyethira	+					+			+				+	+	+	+	+		
Paroxyethira	+																		
Xuthotrichia		+			+														

From this it will be seen that only one family, the *Phryganeidae*, is entirely unrepresented in the region covered by this work, and that most of the families are fairly generally distributed. The *Limnephilidae* are apparently more definitely temperate, being mainly a holaretic group, with a smaller component in the southern hemisphere.

With one exception (*Philanisus plebeius*), no new studies on larvae are given in this work. The study of the earlier stages is a field that can only be explored satisfactorily by Australian and New Zealand workers, and as yet very little has been done. It is hoped that this work, by providing a means of identification of the adults, will also stimulate interest in the earlier stages of this Order.

4. STRUCTURE OF THE TRICHOPTERA.

The Trichoptera, or Caddis-flies, are closely related to the Lepidoptera (Butterflies and Moths), and in general appearance resemble small, rather hairy moths. They may be distinguished from moths by the clothing of the wings, which in Trichoptera consists of hairs, sometimes thickened and scale-

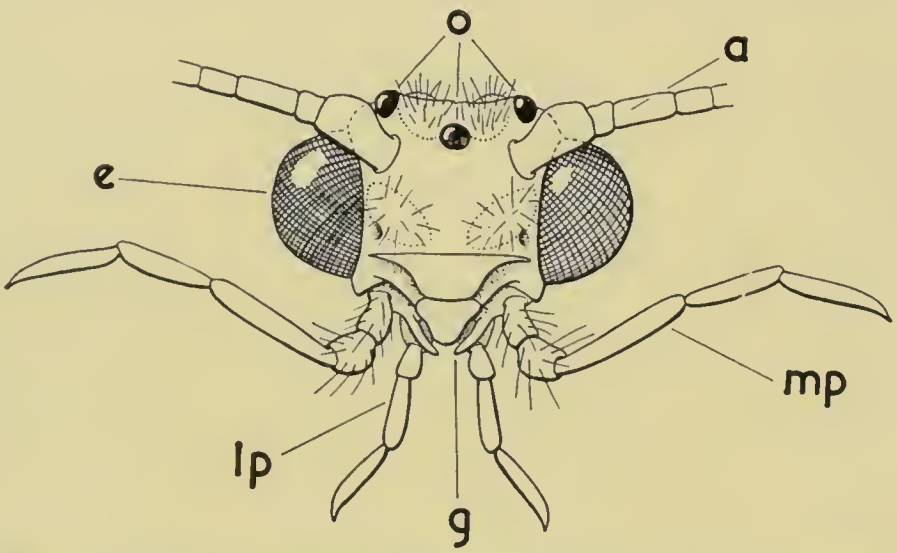

Fig. 2.—Head of a Rhyacophilid Trichopteron. *a*, antenna ; *e*, compound eye ; *g*, galea ; *lp*, labial palp ; *mp*, maxillary palp ; *o*, ocelli.

like, but never entirely of overlapping scales as in the Lepidoptera. The characteristic coiled proboscis of moths is generally considered to be formed by the modification of the galeae ; in Trichoptera the galea is generally small and never coiled as in Lepidoptera.

The *head* (fig. 2) is usually hairy, often with hairy warts. Compound eyes, or oculi, large, usually well-separated, but occasionally almost or completely meeting on the vertex. *Ocelli* usually three, or absent. *Antennae* many-jointed, sometimes very long and thin, basal joints usually larger, often much enlarged. Eversible scent-organs present on the head in some genera (*Hydroptila* and some *Sericostomatidae*, *Beraeidae*, *Odontoceridae*, etc.). *Mouth-parts* reduced, *mandibles* never functional ; *maxillae* with well-developed *palpi*, usually five-jointed (occasionally apparently six-jointed), in the male often with fewer than five joints (Sub-order Inaequipalpia), terminal joint often long, flexible or articulated ; galea small or absent. *Labial palpi* three-

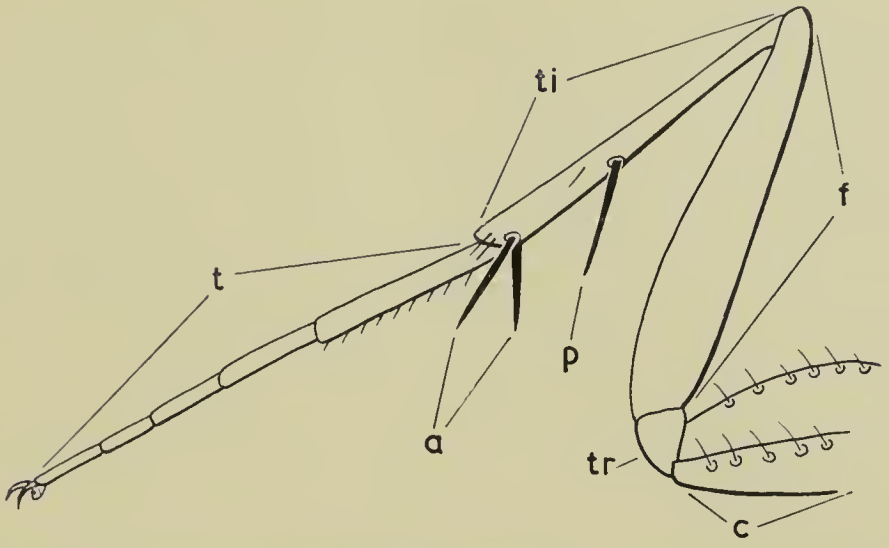

FIG. 3.—Anterior leg of a Rhyacophilid Trichopteron. *a*, apical tibial spurs ; *c*, coxa ; *f*, femur ; *p*, preapical tibial spur ; *t*, tarsus ; *ti*, tibia ; *tr*, trochanter.

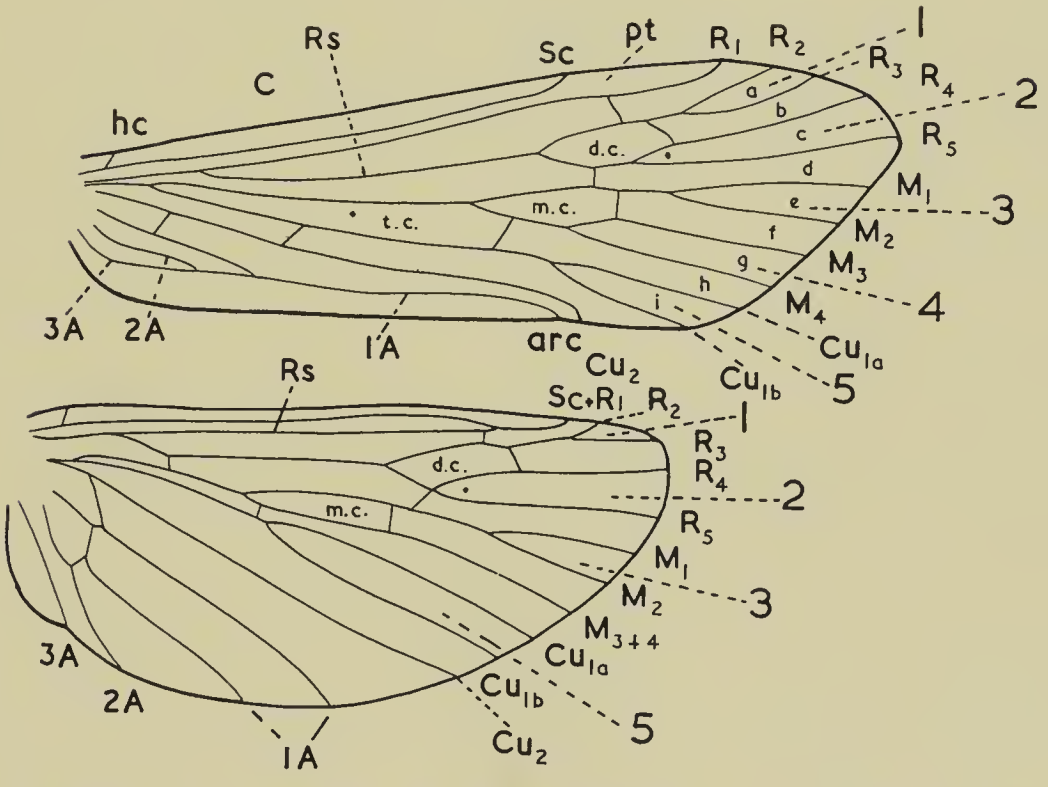

FIG. 4.—Neuration of a trichopterous wing (*Hydropsyche* sp.). *C*, costa ; *Sc*, subcosta ; *Rs*, radial sector ; $R_{1, 2, 3, 4, 5}$, branches of radius ; $M_{1, 2, 3, 4}$, branches of media ; Cu_{1a}, Cu_{1b}, Cu_2, branches of cubitus ; 1A, 2A, 3A, anal veins ; *arc*, arculus ; *d.c*, discoidal cell ; *h.c*, humeral cross-vein ; *m.c.*, median cell ; *pt*, pterostigma ; *t.c.*, thyridial cell ; *a*, *b*, *c*, *d*, *e*, *f*, *g*, *h*, *i*, apical cellules ; 1, 2, 3, 4, 5, apical forks.

jointed (sometimes apparently four-jointed), terminal joint sometimes long, flexible or articulated.

Prothorax small, *meso-* and *metathorax* well developed. *Legs* (fig. 3) formed for running ; tibiae each with up to four socketed spurs, one or two apical and one or two pre-apical ; when the total number is three or less, it is the pre-apical spurs which disappear first. The number of *spurs* on the various tibiae is of some generic importance, and is generally quoted as a formula for brevity. Thus " Spurs 1, 3, 4 " denotes that there is one apical spur on the anterior tibia, two apical and one pre-apical spurs on the middle tibia and two apical and two pre-apical spurs on the posterior tibia.

There are two pairs of *wings*, generally densely clothed with hairs, which are sometimes erect, and sometimes also thickened and scale-like. In flight, the wings are linked by an arrangement of a jugal lobe on the basal angle of the anterior wing, frenular hairs on the base of the costa of the posterior wing, or by a row of minute hooks on the costa of the posterior wing engaging with a turned-over posterior edge of the anterior wing. *Venation* varies from a fairly primitive type to much specialized and reduced types. The system of notation used in this work is based on that employed by Tillyard (fig. 4).

In a typical *anterior wing* the front margin is formed by the *costal vein* (C) ; behind it, and more or less parallel to it, runs the *sub-costa* (Sc), which is linked to the costa near the base by the *humeral cross-vein* (*hc*), and which usually terminates in the costa before the apex of the wing. The next vein is the *radius*, which bifurcates near its base, forming R_1 and Rs (*radial sector*) ; R_1 is sometimes forked at its apex. Rs divides at about the centre of the wing, the two branches often joined by a cross-vein to enclose the *discoidal cell* (*d.c.*). Each branch of Rs may divide again before reaching the wing-margin, to form R_2, R_3, R_4 and R_5. The *media* forks once near the middle of the wing, with a cross-vein between the branches making a *median cell* (*m.c.*), and each branch may divide again to form M_1, M_2, M_3 and M_4. At its base the media is either fused with the cubitus or is linked to it by a cross-vein, and there may be another medio-cubital cross-vein near the centre of the wing, enclosing the *thyridial cell* (or *cellula thyridii*) (*t.c.*). The *cubitus* forks near its base into Cu_1 and Cu_2, the upper branch forking again to make Cu_{1a} and Cu_{1b}. Three *anal veins* may be present, 2A terminating in 1A, and 3A in 2A, before their apices.

In the *posterior wing* a similar arrangement of veins occurs, except that the thyridial cell is always absent, the second branch of the media, M_{3+4}, is never forked, and the anal veins usually run free to the wing margin. One or more of the anal veins may be forked.

The *apical forks* are formed between the branches of Rs, M and Cu_1, fork no. 1 between R_2 and R_3, no. 2 between R_4 and R_5, no. 3 between M_1 and M_2, no. 4 between M_3 and M_4, and no. 5 between Cu_{1a} and Cu_{1b} (since M_3 and M_4 do not separate in the hind wing, fork no. 4 is always wanting in this wing). The presence or absence of the various forks is much used as a generic character. The apical veins between R_2 and Cu_{1b} inclusive are termed *apical sectors* and the spaces between them the *apical cellules*. Fork no. 2 often has near its

base a small thickened chitinous dot, the *facetic spot*, *corneous point* or *wing-spot*, and in the anterior wing there is generally a similar spot in the thyridial cell. When fork no. 2 is absent, the spot is to be found in the cellule between R_{4+5} and M.

There is sometimes a thickened or pigmented area along the anterior margin of the wings about the level of the discoidal cell, known as the *pterostigma* (*pt*). The point on the posterior margin of the anterior wing where 1A terminates is called the *arculus* (*arc*), and the line of cross-veins, more or less between it and the pterostigma, the *anastomosis*. The anal veins in the anterior wing are also called the *post-costa*, and the anal margin the post-costal margin.

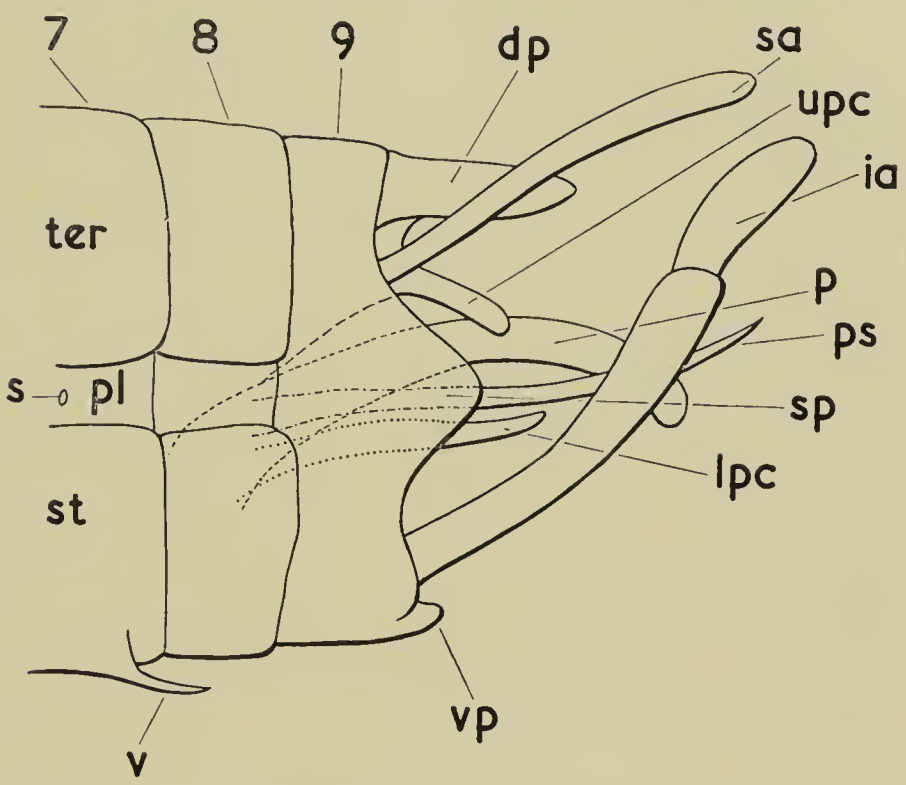

Fig. 5.—Genitalia of a hypothetical ♂ Trichopteron. 7, 8, 9, seventh to ninth abdominal segments ; *dp*, dorsal plate ; *ia*, inferior appendage ; *lpc*, lower penis-cover ; *p*, penis ; *pl*, pleurite ; *ps*, penis-sheath ; *s*, spiracle ; *sa*, superior appendage ; *sp*, side-piece of ninth segment ; *st*, sternite ; *ter*, tergite ; *upc*, upper penis-cover ; *v*, ventral process ; *vp*, ventral plate.

In the male the wing membrane may be modified to form a *fold* or pouch, sometimes enclosing specialized hairs or scales ; the presence of such a fold almost always causes considerable modification of the normal venation, and the naming of the apical forks then becomes somewhat a matter of conjecture. There may also be shallow grooves or depressions in the wing membrane, filled with specialized hairs, or the anterior or posterior margins of the wings may be folded over and filled with such hairs.

The *abdomen* normally consists of ten segments, although in the scheme of

genital nomenclature adopted by Mosely there is provision for only nine segments, the tenth segment being considered as part of the genitalia. Each segment is formed by a *tergite* and a *sternite*, linked laterally by membranous *pleurites*. The first segment is apparently represented by a tergite only, the first visible sternite being that of the second segment. The first seven segments are each provided with a pair of spiracles on the pleurites. The ninth segment in the male has the tergite and sternite usually fused into a complete ring (fig. 5), although there may be a secondary re-division into tergite and sternite, or the tergite may be very much reduced or membranous. From the ninth segment arise two pairs of *appendages*, the *superiors* and the *inferiors*, approximately from the upper and the lower halves of the segment respectively. The superior appendages are single-jointed, but the inferiors may be one- or two-jointed. From the upper part of the ninth segment also arises the *dorsal plate* and the *upper penis-cover*. The latter is particularly diverse in form, ranging from a simple hood, often more of less fused with the dorsal plate, to paired or multi-furcate processes. The dorsal plate and upper penis-cover together form the *tenth segment* of Tillyard and others. Beneath this tenth segment is the *penis*, which may have attached to it one or two *penis-sheaths*, and beneath it may be a *lower penis-cover*. The lateral margins of the ninth segment may be produced to form *side-pieces*, and the centre of the ventral margin to form a *ventral plate*. *Ventral processes* may be found on one or more of the preceding segments, and there can be a pair of *lateral filaments* arising from the upper lateral margins of the fifth sternite.

McLachlan and other workers claim that there is a third pair of appendages, the *intermediates*, attached to the ninth segment. The term "intermediate appendage" has, however, been rather loosely applied, and it seems likely that these so-called intermediate appendages are in many cases homologous with the upper penis-cover, as for instance in the *Limnephilidae*. In other genera, they may well be the superior appendages, originating rather low on the lateral margins of the segment, as in certain *Hydrobiosinae*. There is often a small, hairy wart on the margin of the ninth segment at the base of the dorsal plate, and this has at times (in my opinion wrongly) been considered as the superior appendage. In the present work I have endeavoured to attain some degree of uniformity in the use of these terms, by dropping the term "intermediate appendage" entirely. This has entailed a certain amount of editing of Mosely's manuscript descriptions, chiefly in the *Hydrobiosinae*. To forestall any possible criticism on this point, it should be made clear that the sense of the descriptions has in no way been altered, and since Mosely himself considered these manuscript descriptions as drafts, it is probable that they would have undergone considerable revision at his hands when he came to make up the manuscript for press.

In the *female*, the first seven segments are usually normally formed. The eighth segment may be normal, with a straight hind margin, or it may be modified by division into three lobes by longitudinal slits, or into three areas by longitudinal furrows. The central portion then forms a *sub-genital plate*, and the margin may be further produced. Sometimes the margin is triangu-

larly or trapezoidally excised, with a simple or tri-lobed sub-genital plate in the excision. The genital opening is situated between the eighth and ninth sternites, and there is often a strongly chitinised *vaginal structure* within. The ninth segment may be normally formed, or the sternite may be hollowed out, with the lateral margins of the tergite produced downwards as flaps on each side. Tenth segment usually small, often with a pair of small cerci. The terminal segments are sometimes modified to form a long ovipositor.

5. LIFE HISTORY AND HABITS.

Caddis-flies, with few exceptions, spend all their early stages in water. The *eggs* are laid either in water, generally attached to rocks or water-plants, the female crawling below the surface for oviposition, or they may be attached to rocks or leaves near or overhanging water. In the latter case the emerging larvae crawl or drop into the water. The eggs may be enclosed in a gelatinous envelope or cemented to an under-water surface. The length of the egg-stage varies with temperature, often lasting from about a fortnight to three weeks or a month, although some species may overwinter in the egg-stage. The resulting *larvae* are caraboid or eruciform, without abdominal pro-legs, apart from the anal pair, which are often strongly hooked. The first abdominal segment of case-making larvae frequently bears dorsal and lateral processes ; these, used in conjunction with the abdominal pro-legs, enable the larva to hold its case in position. *Gills* are often present on various parts of the body, respiration also taking place through the body wall.

The cases built by caddis larvae are of many kinds and of diverse materials, such as stone, sand, shells, sticks or leaves, attached by silk to silken tubes. The non-case-making larvae live under stones, or in elaborate silken nets or galleries. The larvae may be phytophagous, carnivorous or omnivorous. In general, the case-making larvae are phytophagous and the free-living forms carnivorous, but at times all are carnivorous. According to Siltala, the *Rhyacophilinae* and *Polycentropodidae* are carnivorous, the *Hydropsychidae*, *Phryganeidae*, *Molannidae* and *Odontoceridae* are omnivorous and the remainder are phytophagous. The *Hydroptilidae* feed largely on algae.

Pupation takes place within the larval case (when one is made) or in a specially constructed shelter made of stones, and attached to a large stone, by the free-living larvae. The case-making forms attach their houses to some support, and the ends, protected by a silken grating, allow the free passage of water for respiration. The *pupa* is a " free pupa," that is, its legs, antennae, wings, etc., are separately encased and not immovably fastened down to the body as in butterfly or moth pupae. The pupa has strong mandibles to enable it to cut its way out of the pupal shelter prior to transformation. After leaving the case or shelter the pupa is very active and swims and crawls rapidly. The legs are provided with double fringes of hairs for swimming. The actual *emergence* may take place at the surface of the water, or the pupa may first crawl out of the water. The adult wings are folded within the pupal wing-cases, and expand to their full size immediately on emergence ; there is no

period of gradual expansion such as occurs in the Lepidoptera. There is often a period of inactivity after emergence to allow the wings to become fully hardened. In due course copulation takes place either in the air or at rest on vegetation.

Adult caddis-flies are mainly crepuscular or nocturnal in habits, although some forms, particularly the *Leptoceridae*, fly in swarms over the water during the day-time. The night-flying caddis are frequently attracted to light and are thus found at times in houses. As has already been stated, the mandibles of adult caddis-flies are non-functional, and the insects are incapable of feeding on solid food. They can, however, partake of liquid food, and have been recorded as visiting flowers and the patches of sugar used by lepidopterists for attracting moths. Lack of liquid food will hasten the death of the insect.

The majority of Australian and New Zealand species of Trichoptera occur in the adult stage during the months of November to March, the peak months in Australia being December and January, and in New Zealand December to February. Very few species have been recorded in the months of May to August.

6. ENEMIES OF TRICHOPTERA.

The main enemies of caddis-flies are fresh-water fishes, for which the larvae form an important item of diet. The adults are also eaten, though less freely. Birds, lizards, frogs, spiders and dragon-flies also feed on the adults. Two species of Hymenoptera have been recorded as parasitizing the larvae of Trichoptera, one in Europe and the other in America.

7. COLLECTION AND PRESERVATION.

Caddis-flies, being aquatic in their early stages, should be sought for in the vicinity of permanent fresh water, such as rivers, streams, waterfalls, springs, lakes, ponds or boggy places ; even quite small trickles, if they are permanent, will provide a home for caddis-flies. The majority of species are restricted to fresh water, but one Antipodean species (*Philanisus plebeius* Walker) is marine, the larvae occurring in rock-pools below high tide level, and making cases of coralline sea-weed. Other European species have been recorded from brackish water in Finland. At the other extreme, one European species (*Enoicyla pusilla*) lives as a larva in damp moss in woods far from actual water.

When collecting adult Trichoptera, the day-flying species may be caught with a net. Other species must be sought for, and attention should be paid to vegetation near water. Grasses and shrubs should be swept with the net. Bushes and branches overhanging water can be lightly tapped with a stick over an open net. Fences, the bark of trees and the underside of ledges on buildings near water will often yield abundantly if examined carefully. Some species shelter in caves, and at high altitudes the underside of stones and rocks provides shelter for caddis-flies. Light traps may also be used for the collection of nocturnal species.

The net frame should be strong, preferably folding for convenience of travelling, either of cane or of light metal. The bag should be of a fine-meshed, strong material. Mosely recommended a white material known as " book-map muslin", but fine nylon material is equally good and extremely durable. The normal fabric used for butterfly nets is of too coarse a mesh to retain the smaller Trichoptera such as the *Hydroptilidae*. At the same time, the material must not be so fine as to be practically impervious to the passage of air. An impervious net forms a cushion of air at its mouth, and the air-flow past this cushion tends to deflect insects from the mouth of the net.

Killing bottles should be charged with cyanide in the usual manner. Special care must be taken to avoid moisture in the killing bottle, as this is very detrimental to the specimens. Discs of thick blotting-paper should be pressed down over the plaster retaining the poison, and crumpled tissue paper placed in the bottle to prevent damage to the specimens from shaking about during transit.

Pins used for Trichoptera should be of stainless steel, to avoid rust ; the ordinary plated-brass entomological pins frequently develop verdigris. Deep-grooved setting boards must be used to prevent damage to the legs of specimens. Where possible, caddis-flies should be set whilst fresh, as relaxed examples do not set so satisfactorily. If this is not possible, they should be pinned and the wings separated a little by blowing on them from behind. This lessens the risk of the wings becoming stuck to the abdomen in subsequent relaxing. Mosely recommends that setting-boards be covered with strips of cellophane, fastened with drawing-pins at each end, and that the same material be used to hold the wings in position whilst drying. After setting, the specimens should be staged on polyporus or pith. Boxes or drawers containing Trichoptera should always contain naphthalene or other preservative to deter insect pests.

Trichoptera may also be preserved in fluid, and for this Mosely recommends a 2% formaldehyde solution (made by diluting one part of commercial 40% formaldehyde with 19 parts of water). This solution is too dense a medium for efficient wetting and penetration, and therefore the specimens should be killed in a mixture of 2 parts of 2% formaldehyde solution and 1 part of 90% alcohol, and subsequently transferred to the 2% formaldehyde for storage. Specimens may be kept in small tubes, plugged with cellulose wadding, and a number of tubes stored mouth downwards in a larger jar, partly filled with the formaldehyde solution. Labels giving the place and date of capture should always be included with the specimens, and should be written in waterproof ink. Labelling should be adequate ; by itself the name of the stream or lake may be intelligible to the collector, but subsequent workers may find it impossible to trace that particular locality in any gazetteer, and therefore the district and preferably also the state should be given.*

For a proper examination of the ♂ genitalia, it is sometimes necessary to remove the abdomen and to clear it by boiling in caustic potash solution (KOH).

* For further details of methods collecting and preserving insects, reference may be made to the British Museum (Natural History)'s *Instructions for Collectors*, No. 4*a* : Insects.

This is best done in a small, wide-necked flask over a spirit lamp. A test-tube should never be used, owing to the risk of a sudden spurt of liquid ejecting the specimen, which may be lost in consequence. After the tissues have been dissolved or softened, the specimen is treated with glacial acetic acid, transferred to clove oil and finally mounted in canada balsam. All the genitalia drawings made for this work have been executed from specimens so cleared in KOH and drawn in fluid before mounting in canada balsam. For full details of the technique employed by Mosely in making preparations of Trichoptera, reference should be made to his article (1943, *Entomologist*, **76** : 227–234, 241–251).

II. SYSTEMATIC ACCOUNT OF THE FAMILIES, GENERA AND SPECIES.

BY THE LATE

MARTIN E. MOSELY

AND

D. E. KIMMINS.

Key to the Families.

By D. E. Kimmins.

1. Insects minute, very strongly pubescent, the wings with numerous erect hairs, wing fringes very long, those of the posterior wings longer than the greatest width of wing; antennae short and stout; maxillary palpi ♂ and ♀ five-jointed, last joint simple . . . . . **HYDROPTILIDAE** Pictet (p. 503).
–. Insects not minute, generally medium-sized or large; anterior wings generally without thick, erect hairs; if present they are scattered in small patches and insect is of medium or large size. Wing fringes shorter than the greatest width of posterior wing; antennae generally as long as, or longer than, the anterior wing; maxillary palpi variable . . . . . 2.
2. Maxillary palpi five- or six-jointed . . . . . 3.
–. Maxillary palpi with fewer than five joints . . . . . 21.
3. Maxillary palpi six-jointed* . . . . **CALAMOCERATIDAE** Ulmer (p. 170). (Genus *Anisocentropus* McLachlan).
–. Maxillary palpi five-jointed . . . . . 4.
4. Terminal joint of maxillary palpi articulated, flexible, generally much longer than all the other joints together . . . . . 5.
–. Terminal joint of maxillary palpi not articulated, mostly not flexible, only little or not at all longer than the remaining joints . . . . . 9.
5. Ocelli present . . . . . **PHILOPOTAMIDAE** Wallengren (p. 385).
–. Ocelli absent . . . . . 6.
6. Anterior tibia with three spurs . . . . . 7.
–. Anterior tibia with less than three spurs . . . . . 8.
7. R_1 in anterior wing forked at its apex . . **PSYCHOMYIDAE** Kolenati (p. 377). (subfam. *Ecnominae* Ulmer.
–. R_1 in anterior wing simple . . . **POLYCENTROPODIDAE** Tillyard (p. 353).
8. Fork no. 1. in anterior wing present . . . **HYDROPSYCHIDAE** Curtis (p. 306).
–. Fork no. 1 in anterior wing absent . . . **PSYCHOMYIDAE** Kolenati (p. 377). (subfam. *Psychomyinae* Kolenati).†
9. Ocelli present . . . . . 10.
–. Ocelli absent . . . . . 12.

* *Psychomyidae*, subfamily *Paduniellinae*, also have six-jointed maxillary palpi, but have not yet been reported from the Australian region.

† Not yet recorded from the Australian region.

10. Middle tibia with four spurs . . . . . 11.
—. Middle tibia with two spurs . . . ♀ **LIMNEPHILIDAE** McLachlan (p. 26).
11. The first two joints of the maxillary palpi short and thick, the third longer and thinner . . . . . **RHYACOPHILIDAE** Stephens (p. 404).
—. Second joint of maxillary palpi longer than the first ♀ **PLECTROTARSIDAE** fam. nov. (p. 20).
12. Median cell in anterior wing present and closed **CALAMOCERATIDAE** Ulmer (p. 170).
—. Median cell in anterior wing absent . . . . . 13.
13. Discoidal cell in anterior wing present . . . . . 15.
—. Discoidal cell in anterior wing absent . . . . . 14.
14. Spurs 2, 2, 4 . . . . . **BERAEIDAE** Wallengren (p. 142).
—. Spurs 2, 4, 4 . . . . . **MOLANNIDAE** Wallengren (p. 147).
15. Both branches of radial sector in anterior wing forked, so that forks nos. 1 and 2 are present (in *Tasimia* Mosely fork no. 1 is absent) . . . 16.
—. Only the upper branch of the radial sector in anterior wing forked, thus fork no. 2 is absent . . . . . 20.
16. A cross-vein is present between the radius and the first apical sector, at least in the anterior wing, or the radius and the first apical sector are fused before the wing margin . . . . . 17.
—. Radius and first apical sector not joined in either wing ♀ **SERICOSTOMATIDAE** McLachlan (p. 29).
17. Discoidal cell present in posterior wing . . . . . 18.
—. Discoidal cell absent in posterior wing . . . . . 19.
18. A small, rounded, strongly chitinized lobe on anal margin of anterior wing near base ; joint of maxillary palpi with a nodule at its apex **PHILORHEITHRIDAE** Mosely (p. 178).
—. Anterior wing without such anal lobe ; no nodule on apex of basal joint of maxillary palpi . . . . . **ODONTOCERIDAE** Wallengren (p. 152).
19. Anterior wing with forks nos. 1 (?), 2 and 3 in both sexes **HELICOPHIDAE** fam. nov. (p. 148).
—. Anterior wing with forks nos. 1 and 2 in ♂, 1, 2 and 5 in ♀ **PHILANISIDAE** fam. nov. (p. 131).
20. Four spurs on middle tibia . . . **ODONTOCERIDAE** Wallengren (p. 152).
—. Two spurs on middle tibia . . . . **LEPTOCERIDAE** Leach (p. 198).
21. Maxillary palpi four-jointed . . ♂ **SERICOSTOMATIDAE** McLachlan (p. 29).
—. Maxillary palpi less than four-jointed . . . . . 22.
22. Maxillary palpi three-jointed . . . . . 23.
—. Maxillary palpi one- or two-jointed . ♂ **SERICOSTOMATIDAE** McLachlan (p. 29).
23. Mouth-parts elongated to form a rostrum . ♂ **PLECTROTARSIDAE** fam. nov. (p. 20).
—. Mouth-parts not elongated . . . . . 24.
24. Maxillary palpi filiform, with cylindrical joints, with neither thick nor upstanding hairs or scales, never lying close to face . . . . . 25.
—. Maxillary palpi thick, often with upstanding hairs or scales, often forming a mask lying close to the face . . ♂ **SERICOSTOMATIDAE** McLachlan (p. 29).
25. Ocelli present, anterior tibia with one spur . ♂ **LIMNEPHILIDAE** McLachlan (p. 26).
—. Ocelli absent, anterior tibia with two spurs ♂ **PHILORHEITHRIDAE** Mosely (p. 178). (*Austrheithrus* gen. n.)

1. Fam. **PLECTROTARSIDAE nov.**

Sericostomatidae Kolenati, 1848, *Gen. et Spec. Trich.*, 1 : 94 (*partim*).
Phryganeidae Banks, 1913, *Trans. Amer. ent. Soc.*, 39 : 234 (*partim*) ; Mosely, 1936, *Proc. zool. Soc. Lond.*, 1936 : 395.

Ocelli present. *Spurs* 1, 4, 4. Neuration of *anterior wing* differing in the two sexes (♂, forks nos. 1, 2, 3 and 5, ♀, nos. 1, 2, 3, 4 and 5). Cellula thyridii

not longer than discoidal cell. *Posterior wing* with two strong frenular spines on costa at base. Radius in posterior wing terminates in the first apical sector.

This family has been erected to receive the single genus *Plectrotarsus* Kolenati. It may be distinguished from others in the *Inaequipalpia* by the elongate form of the mouth-parts. In addition, it differs from the *Phryganeidae* in its three-jointed palpi of the male, the short cellula thyridii, and the radius terminating in the first apical sector of posterior wing. From the *Limnephilidae* it differs in the short cellula thyridii, the termination of the radius in the posterior wing, and in the presence of four spurs on the median tibia. From the *Sericostomatidae* it differs also in the presence of ocelli (present only in the *Thremminae*).

Plectrotarsus Kolenati.

Plectrotarsus Kolenati, 1848, *Gen. et Spec. Trich.*, **1** : 94, pl. 2, fig. 22.
Plectrotarsus Ulmer, 1907, *Gen. Inscct.*, **60a** : 99–100.
Plectrotarsus Cummings, 1914, *Ann. Mag. N. H.*, (8) **14** : 25–31.
Plectrotarsus Mosely, 1936, *Proc. Zool. Soc. Lond.*, **1936** : 396.

Spurs 1, 4, 4 (other writers give them as 2, 4, 4). *Antennae* very stout, basal joint large and bulbose, second very small, third rather larger than the second and each of the following joints. *Ocelli* present. *Maxillary palpi* of the ♂ three-jointed, joints cylindrical ; first joint short, second about twice the length of the first, third a little shorter than the second ; maxillary palpi of the ♀ five-jointed, with a short basal joint, the second longer, third shorter than the second but a little longer than the first, fourth and fifth long, about equal to each other but shorter than the third. *Labrum* produced in a long proboscis.

Wings broad, anterior covered with dense, chocolate- or reddish-brown pubescence, with or without white spots or patches ; discoidal cell long and narrow, cellula thyridii about the same length ; forks nos. 1, 2, 3 and 5 present in the ♂, 1, 2, 3, 4 and 5 in the ♀ ; all the forks sessile ; in the posterior wing, discoidal cell very small ; radius bent strongly downward and merging in the first apical sector ; forks nos. 1, 2 and 5 present in both sexes.

Genitalia, ♂, with a pair of calliper-shaped inferior appendages arising from very broad bases.

Type species.—*Plectrotarsus gravenhorstii* Kolenati, 1848.

Key to Species of *Plectrotarsus*

1. Wings reddish-brown, sometimes with blue-black patches
P. gravenhorstii Kolenati (p. 25).
–. Wings dark brown, with white markings . . . . . 2.
2. Anterior wing with a conspicuous white streak at anastomosis
P. tasmanicus Mosely (p. 21).
–. Anterior wing with several conspicuous white blotches *P. minor* sp. n. (p. 26).

Plectrotarsus tasmanicus Mosely (figs. 6, 7*b*, 8).

Plectrotarsus gravenhorstii var. Walker, 1852, *Cat. Neur. Brit. Mus.*, **1** : 97.
Plectrotarsus gravenhorstii Banks *nec* Kolenati, 1913, *Trans. Amer. Ent. Soc.*, **39** : 234.
Plectrotarsus tasmanicus Mosely, 1936, *Proc. Zool. Soc. Lond.*, **1936** : 396–399, figs. 1–7.

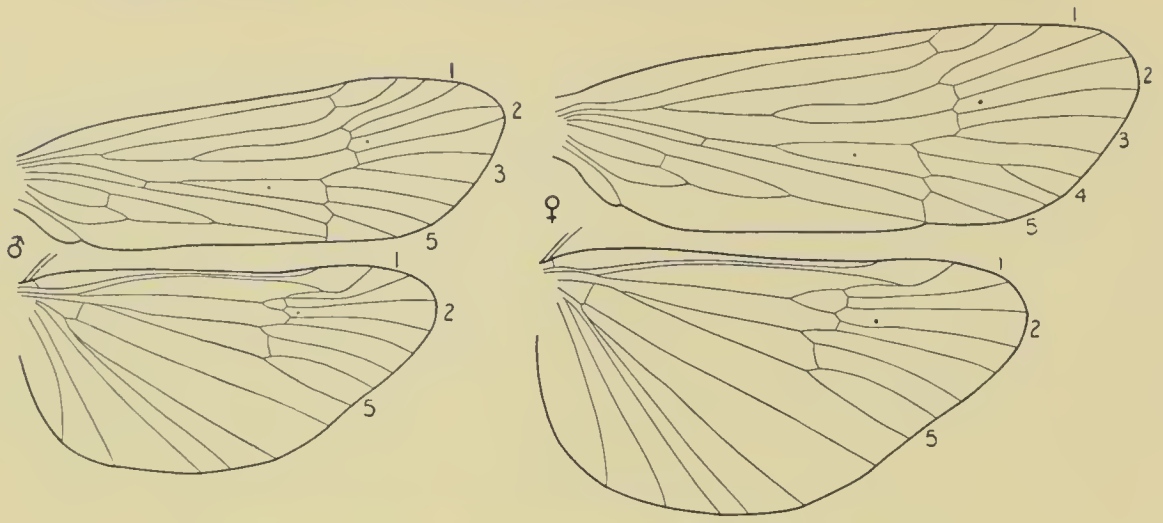

FIG. 6.—*Plectrotarsus tasmanicus* Mosely. ♂♀ wings.

FIG. 7.—Wings of *a*, *Plectrotarsus minor* sp. n.; *b*, *P. tasmanicus* Mosely. (Photo. D. E. K.)

Head black, with a pair of yellow warts bearing yellow hairs at the back ; oculi very dark brown ; *antennae* short, stout and black ; frons, haustellum, palpi yellow, similar in form to those of *P. gravenhorstii* ; *prothorax*, mesothorax and metathorax, yellow, with yellowish hairs ; *legs* yellow, with patches of fuscous on the femora, in some examples entirely fuscous ; tarsi yellowish fuscous ; spurs yellow ; spines black ; *abdomen* bright yellow both above and beneath ; *wings* dark chocolate-brown, no doubt black in life, with a conspicuous white streak at the anastomosis extending between the costa and the

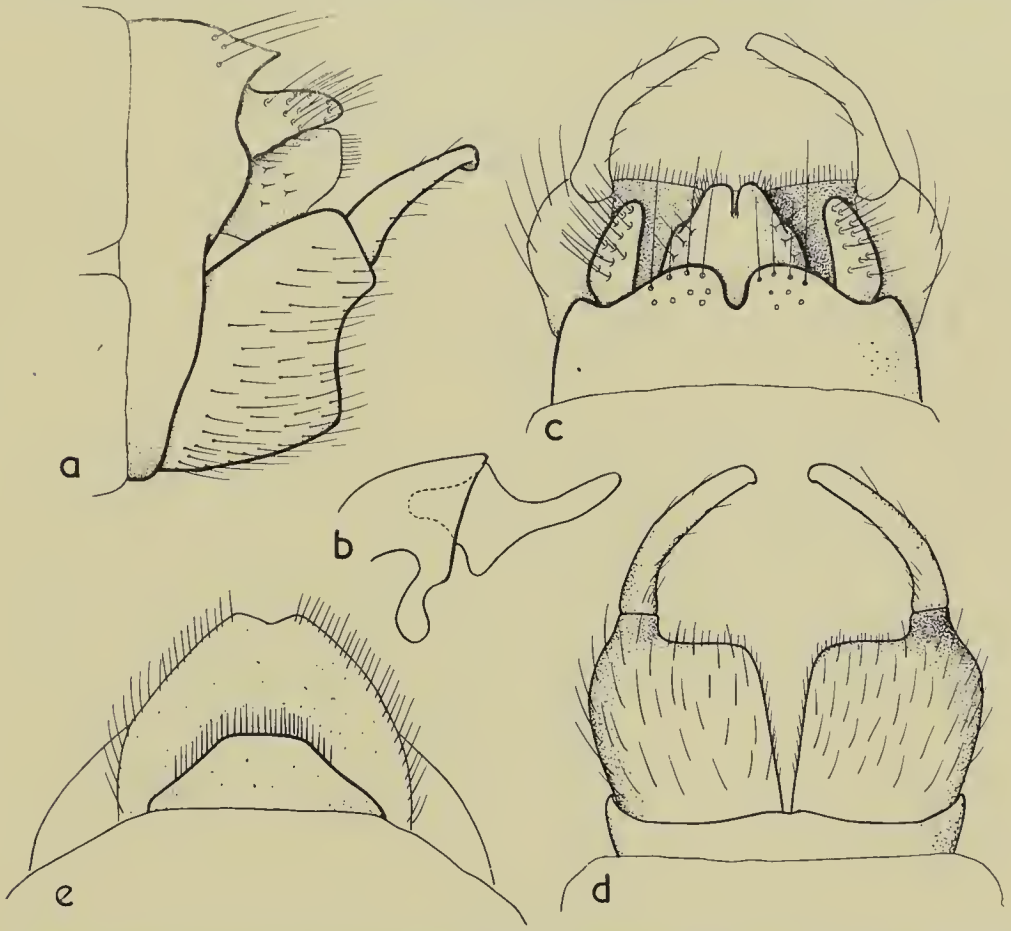

Fig. 8.—*Plectrotarsus tasmanicus* Mosely. *a*, ♂ genitalia, lateral ; *b*, penis, lateral ; *c*, ♂ genitalia, dorsal ; *d*, ♂, inferior appendages, ventral ; *e*, ♀, apex of abdomen, ventral.

anal margin, a white spot at the base of fork no. 2, another on the costa towards the apex, and a few whitish hairs making a small cloud midway between the arculus and the base of the wing ; these spots vary in number and position in individual insects.

Genitalia, ♂.—All the genital parts are yellow. Margin of the ninth dorsal segment produced at its centre in two rounded lobes, with an excision between ; superior appendages short and triangular. There is a hood-shaped upper penis-cover, apex excised, with an apparent slot on its upper surface caused by two approximating lateral plates. Penis short, straight and concealed.

Inferior appendages two-jointed; basal joint from the side, very large and convex, with the second joint arising from a truncate apex; second joints slender from above and below, curving inwards like a pair of callipers; from beneath, the basal joints are nearly square, with a narrow excision between.

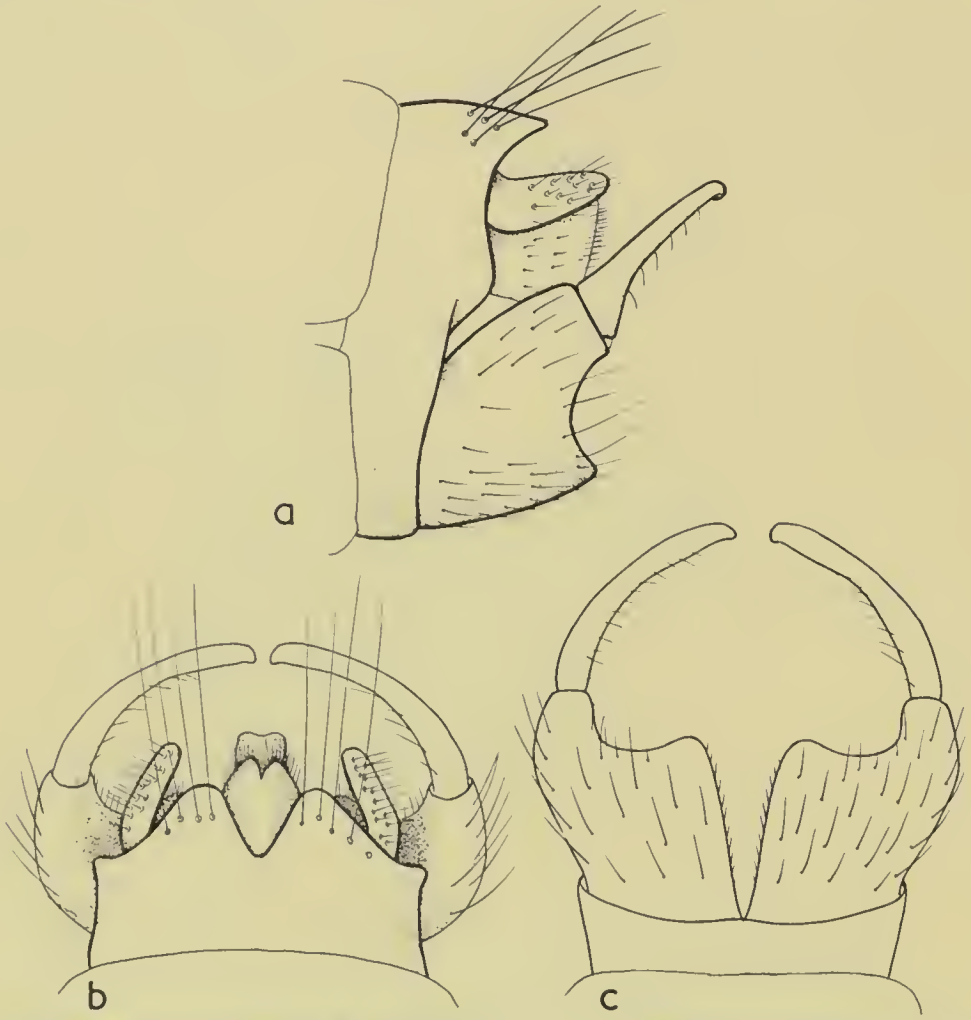

FIG. 9.—*Plectrotarsus gravenhorstii* Kolenati. ♂. *a*, genitalia, lateral; *b*, dorsal; *c*, inferior appendages, ventral.

Genitalia, ♀.—The abdomen terminates in a hood-shaped plate, or perhaps two plates joined by a membrane, with the apex excised; beneath these is a fringed, trough-shaped lip covering what appears to be a vulvar scale.

Length of the anterior wing: ♂, 9 mm.; ♀, 11 mm.

TASMANIA: Penstock, i. 1931, C. Parker; Miena, Great Lake, xii.1930, C. Parker: xii.1929, H. M. Stephen; Cradle Mts., 15.i.1917, R. J. Tillyard.

This is, no doubt, the "var." described by Walker in his *Catalogue of the Neuroptera in the British Museum*, in which he mentions three examples from Tasmania. In all the examples of the species taken by Messrs. Parker and Stephen, the spines of the legs are deep black and the spurs yellow, but in all

the British Museum (N.H.) examples of the genus, both from Australia and Tasmania, the spines are yellow as well as the spurs. It is possible that the black colour is lost in the course of time.

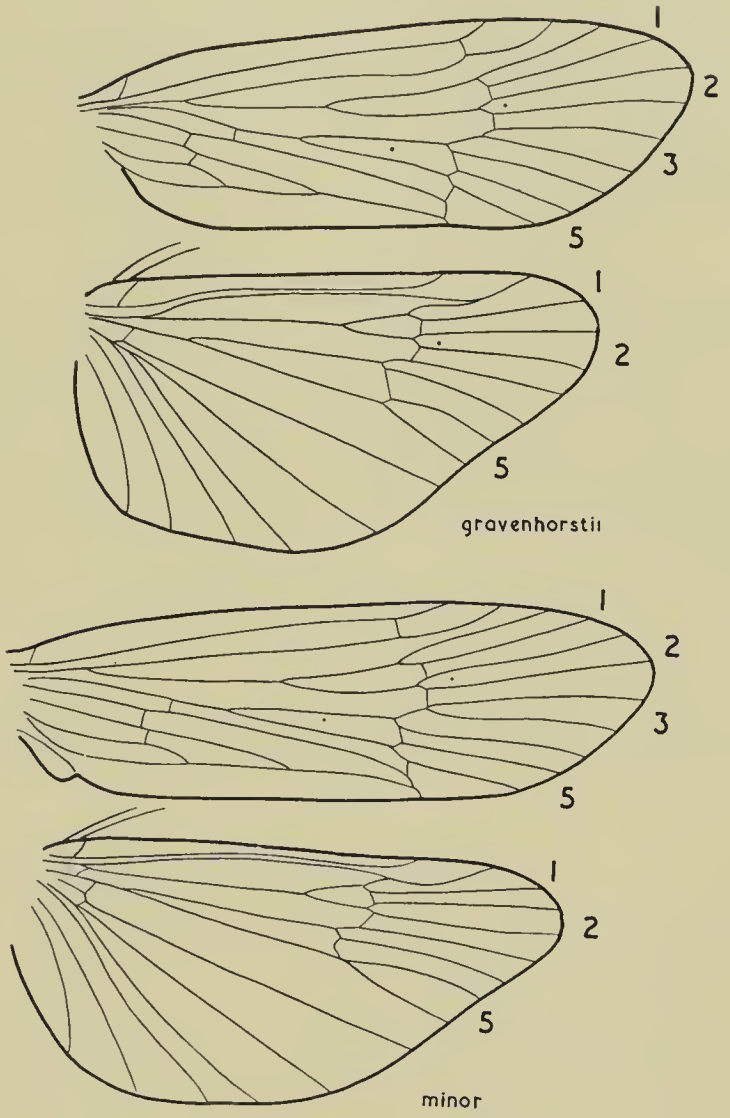

Fig. 10.—Wings of *Plectrotarsus* spp., ♂♂.

Plectrotarsus gravenhorstii Kolenati (figs. 9, 10).

Plectrotarsus gravenhorstii Kolenati, 1848, *Gen. et Spec. Trich.*, **1** : 94, pl. 2, fig. 22.
Plectrotarsus gravenhorstii Walker, 1852, *Cat. Neur. Brit. Mus.*, **1** : 97, specimen *d*.
Plectrotarsus gravenhorstii Hagen, 1881, *Proc. Boston Soc. Nat. Hist.*, **20** : 430.
Plectrotarsus gravenhorstii Ulmer, 1904, *Zool. Anz.*, **28** : 56, figs. 2–3.
Plectrotarsus gravenhorstii Ulmer, 1905, *Ann. Soc. Ent. Belg.*, **28** : 20.
Plectrotarsus gravenhorstii Ulmer, 1907, *Gen. Insect.*, **60a** : 100, pl. 9, fig. 78 ; pl. 12, fig. 108.
Plectrotarsus gravenhorstii Mosely, 1936, *Proc. Zool. Soc. Lond.*, **1936** : 399, figs. 8–10.

Wings reddish-brown, sometimes with irregular dark blue or black patches or stains. *Genitalia* similar to those of *Pl. tasmanicus*, described fully on p. 23, but with some very slight variation in the proportions of the different parts, which will be best appreciated by a comparison of the figures.

An example in the British Museum (N.H.) determined as this species, from Tasmania, has the head and thorax reddish, together with the base of the anterior wing, the remainder of this wing being almost entirely black.

Australia : Victoria, Melbourne.

Tasmania.

Occurs during the months of November and December.

Plectrotarsus minor sp. n. (figs. 7*a*, 10).

Insect smaller than either *P. gravenhorstii* or *P. tasmanicus*. *Head* with a mass of golden hairs between the posterior margin and the thorax. *Antennae* black. A few short, white hairs on each side of the labrum. *Palpi* and *abdomen* yellow. *Thorax* black. *Legs* : anterior yellow with a dark, fuscous streak on the outside of the femora ; median legs yellow, shading to fuscous at the tarsi ; posterior femora and tarsi fuscous, tibiae yellow. *Wings* dark fuscous (probably black in life) ; anterior slightly darker than the posterior and ornamented with six or seven conspicuous white marks ; posterior unicolorous with two long spines arising from the costal margin at the base.

Genitalia, ♂.—Similar to that of *P. gravenhorstii*.

Length of the anterior wing : ♂, 6·5 mm.

W. Australia : Albany, 4.xii.1886, McLachlan Collection, 3 ♂, 1 ♀.

This species differs from the previous species in its smaller size and its different wing-pattern.

2. Fam. **LIMNEPHILIDAE** Kolenati.*

Limnophilidae Kolenati, 1859, *Gen. et. Spec. Trich.*, pt. 2 : 29.
Limnephilidae McLachlan, 1863, *Ent. Ann.*, 171.
Limnophilidae Ulmer, 1907, *Gen. Insect.*, 60a : 29.

Antennae as long as, or slightly shorter than, the wings, moderately stout, basal joint bulbose ; *ocelli* always present ; *maxillary palpi* ♂ three-jointed, ♀ five-jointed, similar in form in both sexes, only slightly pubescent ; labial palpi small, terminal joint often concave. *Legs* with the tibial spurs varying according to genus ; the anterior with never more than one spur, sometimes without a spur at all ; intermediate legs with never more than three spurs ; tibiae and tarsi usually armed with strong spines.

Genitalia, ♂, fairly constant in character. There are generally a pair of small superior appendages and a pair of elongate inferior appendages. Penis usually short and accompanied by a pair of sheaths, often pectinate in form or heavily fringed.

* Kolenati formed his family name *Limnophilidae* from the emended generic name *Limnophilus*, which was proposed by Burmeister for *Limnephilus* Leach. Since this emendation is invalid, the family name must be *Limnephilidae*.

In the ♀ there is a vulvar scale consisting of a pair of side-lobes with a central tongue of varying length.

Anterior *wings* generally parchment-like, with scanty pubescence, but sometimes densely clothed ; discoidal cell always closed, median cell absent, cellula thyridii long and narrow ; apical forks 1, 2, 3 and 5 present ; posterior wings always much broader than the anterior and less pubescent, often iridescent, apical forks nos. 1, 2, 3 and 5 present ; discoidal cell closed (except in the *Apataniinae*) ; the neuration is generally similar in the two sexes but in certain genera there is a long pencil of hairs towards the base of the posterior wing in the ♂ sex only ; the pencil of hairs, when present, is contained in a fold of the wing membrane.

Archaeophylax gen. nov. (Kimmins).

Spurs 1, 2, 2. Anterior *wings* rounded at the apices, more particularly in the ♂. Discoidal cell in both wings long and narrow, longer than the footstalk. Forks nos. 1, 2, 3 and 5 present in both wings.

Type species.—*Archaeophylax ochreus* sp. n.

[Mr. Mosely had intended to place this species in the genus *Ironoquia* Banks, but Dr. F. Schmid's revision of that genus (1951) raised doubts in my mind and I submitted sketches to him for his opinion. He kindly confirmed that it should be placed in a new genus and suggested the generic name. It is allied to *Halesinus* Ulmer, but differs in its spur formula and in having the wing venation similar in both sexes. D. E. K.]

Archaeophylax ochreus sp. n. (figs. 11, 12).

Head, *thorax*, *abdomen* and *legs* dark ochraceous ; *wings* rather paler, in the ♂ darker round the edges and at the anastomosis. In the ♀ there is no darkening of the edges or anastomosis.

Genitalia, ♂.—From above, there are two tufts of hairs towards the margins of the eighth tergite. Distal margin of the ninth segment produced at its centre in a bifurcate dorsal plate, wide at its base, each fork short and broad, with truncate distal margin. Superior appendages extending to about the end of the dorsal plate and appearing to arise from the margin of the ninth segment. Upper penis-cover formed by two large, separate processes with sinuous margins, directed downwards from the side, with a rounded excision near the base to leave a produced, rounded knob bearing some long hairs. Penis, from above, very slender and transparent, lying between a pair of very long, conspicuous sheaths ; it is directed distally between the branches of the upper penis-cover. Ventral margin of the ninth segment strongly produced with a truncate apical margin, slightly excised and extending distally to about the middle of the upper penis-cover ; the basal margin extends laterally in a pair of processes simulating inferior appendages.

Genitalia, ♀.—From above, dorsal segment terminates in a blunt triangle, distal margin slightly excised and with triangular plates arising on the lateral margins ; from the side, the distal margin of the segment is deep, the triangular plates appearing as rounded lobes ; from beneath, there is an arched plate

and the vulvar scale (?), which has a broad, ridged centre and rather longer side-pieces.

Length of the anterior wing : ♂, 17 mm. ; ♀, 18 mm.

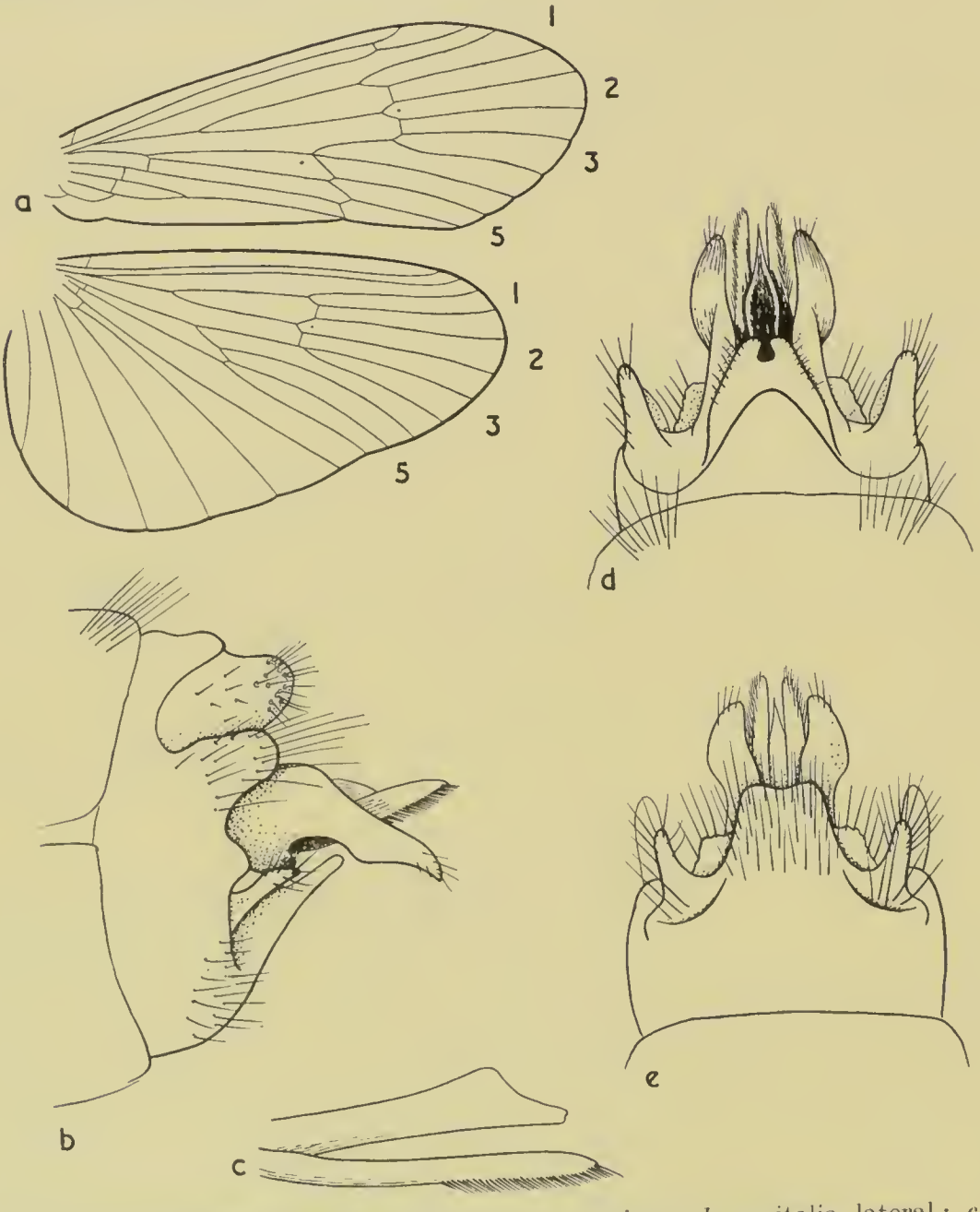

Fig. 11.—*Archaeophylax ochreus* gen. sp. n. ♂. *a*, wings ; *b*, genitalia, lateral ; *c*, penis and sheath, lateral ; *d*, genitalia, dorsal ; *e*, ventral.

Tasmania : Mt. Wellington, 3700 ft., 7.ii.1942, J. W. Evans, 3 ♂, 2 ♀ : Cuvier R., ii.1941 (*Type* ♂).

Australia : New South Wales, Mt. Kosciusko, L. Cootapatomba, 6200 ft., 1.i.1933, 27.i.1930, R. J. Tillyard, 2 ♂, 1 ♀.

3. Fam. **SERICOSTOMATIDAE** McLachlan.

McLachlan, 1876, *Rev. Syn., Trich.* : 221.
Ulmer, 1907, *Gen. Insect.*, **60a** : 78.

Antennae as long as the wings, or slightly shorter, moderately stout ; basal joint large, about as long as head or a little longer, sometimes with specialized processes. *Ocelli* absent (except in *Thremminae*, which have not been found

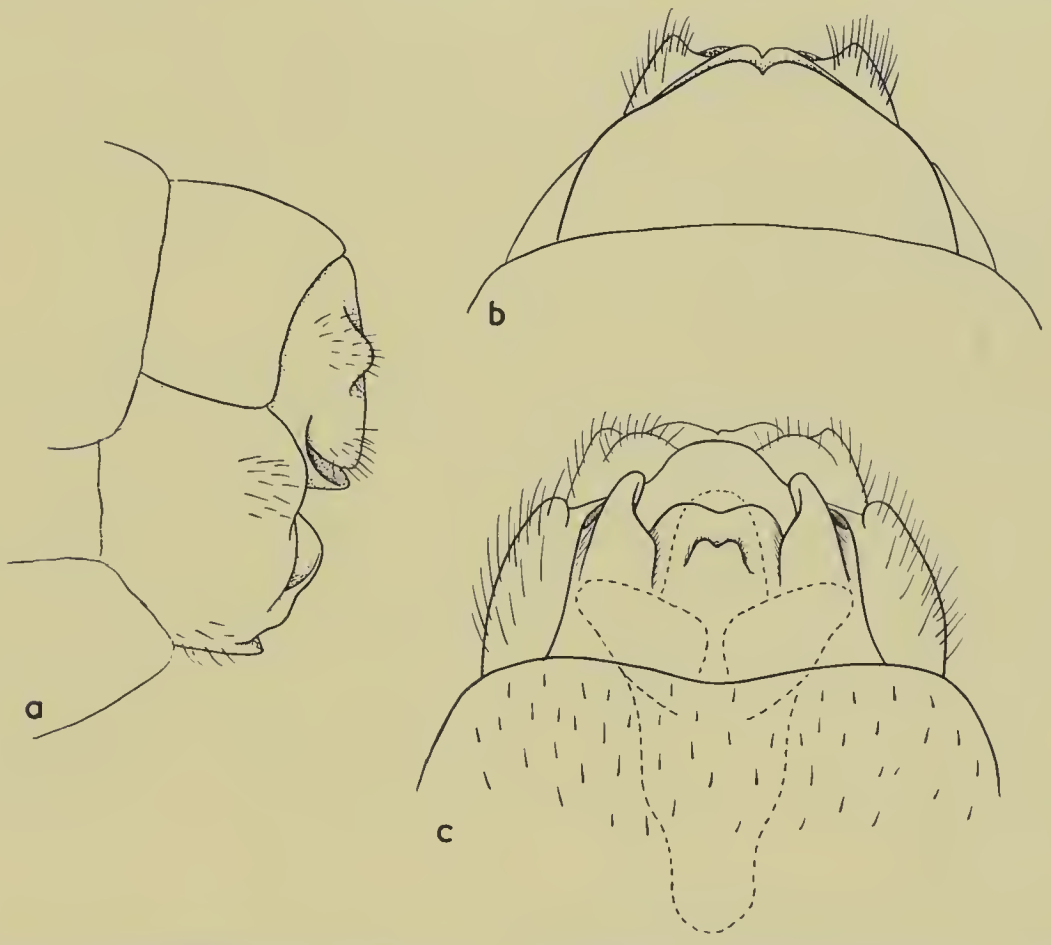

Fig. 12.—*Archaeophylax ochreus* gen. sp. n. ♀ genitalia. *a*, lateral ; *b*, dorsal ; *c*, ventral.

in this faunal region). *Maxillary palpi* of male always different in form from those of female, often membranous and clothed with specialized hairs or scales ; they may be pressed against the face, or merely carried upturned ; they are frequently, in this sex, associated with scent-diffusing apparatus. The number of joints varies from one to three, or exceptionally four, but in the female there are always the usual five joints. Labial palpi alike in both sexes. There may be specialized scent-organs of the frons in the male. *Spurs* 2, 2, 2 or 2, 2, 4 or 2, 4, 4. *Wings* usually densely pubescent, often with scales or specialized hairs mingled with the ordinary form of hairs ; often with scale-lined grooves and sometimes with folds as well, or folds without additional grooves ; pos-

terior wings usually without folds, but sometimes with grooves; neuration varying greatly according to genus, or even in the same genus, or between the sexes of the same species; neuration generally more regular in the female than in the male.

[The majority of the genera of the Sericostomatidae from this region will not fit into existing sub-families, and as I am reluctant to create new sub-families for the members of a regional fauna without also studying the family as a world-wide unit, I have decided to give a key to the genera without division into sub-families.—D. E. K.]

KEY TO GENERA OF *Sericostomatidae*.

1. Spurs 2, 2, 2 . . . . . *Coenoria* gen. n. (p. 31).
–. Spurs other than 2, 2, 2 . . . . . 2.
2. Spurs 2, 2, 4 . . . . . 3.
–. Spurs 2, 4, 4 . . . . . 16.
3. Male with a hinged process on the frons, generally forked or bilobed . . 4.
–. Male without such a process on the frons . . . . . 7.
4. Fork no. 2 in anterior wing with a footstalk; male anterior wing with a fold along the radial sector . . . . . *Pycnocentria* McLachlan (p. 33).
–. Fork no. 2 in anterior wing sessile; no fold along sector in male anterior wing, although there may be folds or grooves elsewhere on the wing . . . 5.
5. Male anterior wing with two folds, one in the subcostal area, the other in the cubital area, and the space between these folds set with erect, clavate hairs *Matasia* Mosely (p. 42).
–. Male anterior wing with less than two folds . . . . . 6.
6. Anterior wing, discoidal cell longer than its footstalk . . *Hampa* gen. n. (p. 44).
–. Anterior wing, discoidal cell much shorter than its footstalk *Costora* Mosely (p. 45).
7. Discoidal cell of anterior wing open or wanting, at least in the male . . 8.
–. Discoidal cell of anterior wing closed . . . . . 9.
8. Male anterior wing with a callosity at base, covering a mass of broadened hairs; maxillary palpi two-jointed . . . *Beraeoptera* gen. n. (p. 52).
–. Male anterior wing without callosity at base; maxillary palpi three-jointed *Antipodoecia* Mosely (p. 55).
9. Discoidal cell in posterior wing open . . . . . 10.
– Discoidal cell in posterior wing closed apically, although its upper margin may be obsolete . . . . . 14.
10. Male maxillary palpi four-jointed . . . . *Tamasia* Mosely (p. 56).
—. Male maxillary palpi less than four-jointed . . . . . 11.
11. Male; anal margin of posterior wing folded over; forks nos. 1, 2 and 3 present *Caenota* gen. n. (p. 61).
—. Male; anal margin of posterior wing not folded over; forks other than nos. 1, 2 and 3 . . . . . 12.
12. Forks nos. 1, 2 and 5 in posterior wing; male maxillary palpi three-jointed *Tismana* gen. n. (p. 65).
—. Forks nos. 1, 3 and 5, or 1 and 5 in posterior wing; male maxillary palpi two-jointed . . . . . 13.
13. Female maxillary palpi with basal joint very long, almost as long as the four succeeding joints together; posterior wing with the middle of the costal margin humped; fork no. 5 absent in anterior wing. *Saetotricha* Brauer (p. 79).
—. Female maxillary palpi with basal joint long, but not as long as four succeeding joints; costal margin of posterior wing not humped; fork no. 5 present in anterior wing . . . . . *Helicopsyche* Hagen (p. 65).
14. Male anterior wing with long folds or grooves . . . . . 15.

14. Male anterior wing without long folds or grooves, but with a scent-organ present under a callosity at the base of the wing *Pycnocentrodes* Tillyard (p. 80).
15. Male anterior wing with a fold along the radius only ; maxillary palpi three-jointed . . . . . *Conoesucus* Mosely (p. 87).
—. Male anterior wing with a fold along the radius and another in the cubital area ; maxillary palpi single-jointed . . . *Lingora* Mosely (p. 93).
16. Radius terminates in first apical sector in both wings . . . . . 17.
—. Radius terminates in the margin of the wing . . . . . 19.
17. Male maxillary palpi three-jointed . . . *Zelandopsyche* Tillyard (p. 116).
—. Male maxillary palpi single-jointed 18
18. Male anterior wing, only forks nos. 1 and 2 present ; female anterior wing, upper margin of discoidal cell straight . . . *Oeconesus* McLachlan (p. 97).
—. Male anterior wing, forks nos. 1, 2 and 3 present ; female anterior wing, upper margin of discoidal cell excised . . *Pseudoeconesus* McLachlan (p. 107)
19. Discoidal cell of anterior wing open ; male maxillary palpi four-jointed *Tasimia* Mosely (p. 121).
—. Discoidal cell of anterior wing closed . . . *Olinga* McLachlan (p. 126).

Coenoria gen. n.

Ocelli absent. In the ♂, *frons* with a forked, hinged process, on each side of which is a membranous filament. *Antenna* with the basal joint slightly longer than the width of the head between the oculi ; second joint small, smaller than each of the succeeding joints. *Maxillary palpi* two-jointed ; basal joint long, about twice the length of the terminal ; labial palpi, first joint shorter than the second and third. *Wings :* discoidal cell present in both wings ; in the anterior, forks nos. 1, 2, 3 and 5 present, in the posterior, forks nos. 1 and 2 ; other forks doubtful. Costa of the posterior wing humped towards the base. *Spurs* 2, 2, 2. This description is based on the ♂ sex only, ♀ unknown.

Type species.—*Coenoria boera* sp. n.

This genus may be separated from other described Australian Sericostomatidae by its spur-formula, 2, 2, 2.

Coenoria boera sp. n. (figs. 13, 14).

On the anterior *wing* there are two golden-yellow, adjacent spots below the discoidal cell and similar but smaller spots in six or seven of the apical cellules ; a golden-yellow, elongate patch towards the base of the wing. Markings vary in individuals. Other characters are given in the generic description.

Genitalia, ♂.—From above, distal margin of the eighth tergite fringed with long hairs. Distal margin of the ninth deeply excised with a triangular process set in the centre of the excision and raised above it. On each side of the apex of the triangular process, and attached to the margin of the segment, appears an upper part of the upper penis-cover in the form of a short, finger-like process ; this upper part is joined to the main part, which appears as a pair of long, pointed processes with blackened apices. Penis rather long and straight, with some minute spines near its apex. Inferior appendages, from the side, arising from slender stems, stout, curving upwards along the side of

the terminal segment, outer margins strongly dentate, inner ventral angles produced and nearly meeting. From beneath, the centre of the margin of the ninth segment is produced in a pair of slender processes, side by side. A very wide, spatulate process to the seventh sternite.

Length of the anterior wing, ♂, 4 mm.

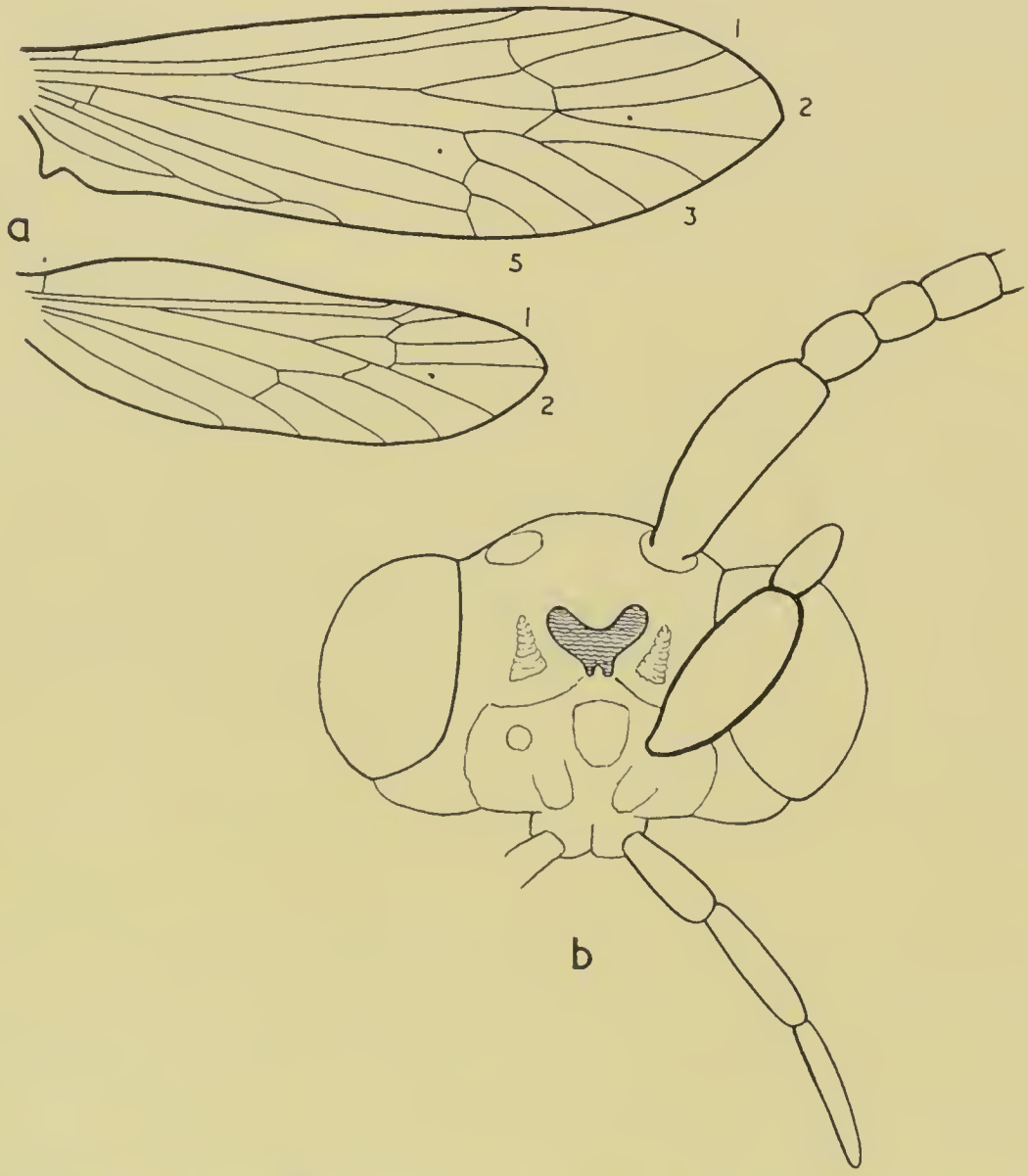

Fig. 13.—*Coenoria boera* gen. sp. n. ♂. *a*, wings; *b*, head from front, antenna and palpi of one side omitted.

Australia : New South Wales, Ebor, 8–10.i.1916, 3 ♂; F.C.T., Blundels, 15.iii.1931, L. F. Graham, 3 ♂ (C.S.I.R. Collection).

Type, ♂ (microscope preparation, Ebor, 10.i.16) and paratypes, ♂, in the British Museum (N.H.), other paratypes in the C.S.I.R. Collection, Canberra.

Pycnocentria McLachlan.

Pycnocentria McLachlan, 1866, *Trans. Ent. Soc. Lond.*, (3) **5** : 251–252.
Pycnocentria Hutton, 1899, *Trans. N. Zeal. Inst.*, **31** : 238.
Pycnocentria Hudson, 1904, *N. Zeal. Neur* : 67.
Pycnocentria Ulmer, 1907, *Gen. Insect.*, **60a** : 98.

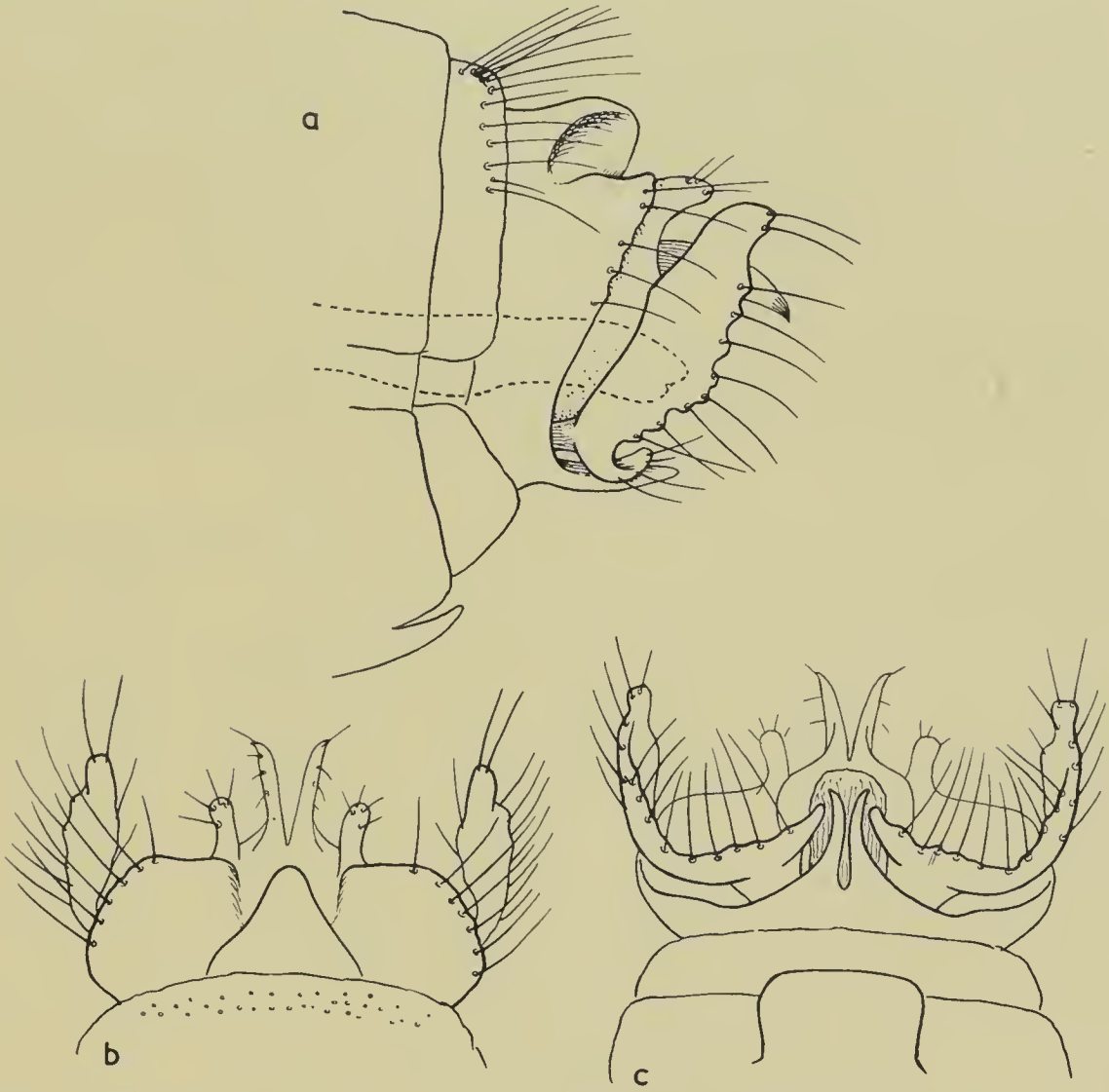

Fig. 14.—*Coenoria boera* gen. sp. n. ♂. Genitalia. *a*, lateral ; *b*, dorsal ; *c*, ventral.

McLachlan describes the genus as follows :

"Antennae slender, about the length of the wings ; basal joint thick and strong, nearly straight, longer than the head. Head transversely subquadrate ; an oblique, elongated, oval tubercle on each side, placed close to the eye, and fringed with long hairs. Maxillary palpi of the male two-jointed ; the basal joint very small and concealed ; the second joint long and thick, curved up in front of the face between the basal joints of the antennae, and furnished with long and strong hairs : of the female five-jointed ; the basal joint short ; the second long and stout ; the third

equal in length to the second, but much thinner; the fourth and fifth shorter and still thinner, nearly equal. Labial palpi small. Mesothorax smooth and polished, elevated in the middle. Anterior wings clothed with short dense pubescence, dilated before the elliptical apex; in the male there is a longitudinal fold furnished with coarse hairs, extending nearly the whole length of the wing, and obliterating the discoidal cell, which is probably closed; the apical veins radiating. In the female this fold is absent, and there is a long and narrow, closed discoidal cell. Posterior wings shorter than the anterior, and scarcely so broad as the broadest portion of the latter; obtuse at the apex: in the male with a longitudinal fold extending obliquely from near the base to near the apex of the costal margin, obliterating the subcosta and the radius; the discoidal cell closed; apical forks four. Legs moderately long and slightly hairy; spurs 2–2–4; anterior and intermediate tibiae furnished each with a pair of moderately long and unequal apical spurs; posterior tibiae with two pairs of nearly equal spurs, the first pair placed close up to the apical. Abdomen short.

"A well-marked and distinct genus of *Sericostomidae*, with somewhat the *facies* of the European genus *Silo* of Curtis, to which it has some analogy in the presence of the longitudinal folds in the wings of the male, but in *Silo* it is only the posterior wings that are thus provided. The two pairs of spurs on the posterior tibiae are placed closer together than in any other genus with which I am acquainted."

Type species.—*Pycnocentria funerea* McLachlan, 1866.

The fold on the male posterior wing of *funerea*, to which McLachlan refers above, is somewhat doubtful. In a denuded wing, the sub-costa and radius stand out quite clearly, with no apparent fold in their region.

In all the species, there is a pair of branched, membranous, extensile processes situated on the frons and present in the male sex only.

[In anterior *wing*, ♂, forks uncertain, ♀, forks nos. 1, 2, 3, 5; in posterior wing, in both sexes, the radius terminates in the wing margin, forks nos. 1, 2 and 5 present. ♂, *Maxillary palpi* single-jointed.—D. E. K.]

Key to Species of *Pycnocentria*, Males.

1. Inferior appendages from the side bifurcate . . . *P. funerea* McLachlan (p. 40).
–. Inferior appendages from the side simple . . . . . 2.
2. Inferior appendages straight or slightly sinuous from the side *P. evecta* McLachlan (p. 35).
–. Inferior appendages abruptly angled upwards about midway *P. forcipata* sp. n. (p. 38).

Pycnocentria evecta McLachlan (figs. 15, 16).

Pycnocentria evecta McLachlan, 1868, *Journ. Linn. Soc. Lond. Zool.*, **10**: 199–200, 211, pl. 12, fig. 3.
Pycnocentria evecta McLachlan, 1873, *Ann. Mag. N. H.*, (4) **12**: 40.
Pycnocentria evecta Hutton, 1899, *Trans. N. Zeal. Inst.*, **31**: 239.
Pycnocentria evecta Hudson, 1904, *N. Zealand Neur.*: 68–69, pl. lx, figs. 5–6.
Pycnocentria evecta Ulmer, 1907, *Gen. Insect.*, **60a**: 98, t. 12, fig. 105.
Pycnocentria evecta Tillyard, 1924, *Trans. N. Zeal. Inst.*, **55**: 308, fig. 22.

McLachlan describes the species as follows:

"*Head—antennae* yellow, obscurely annulated with fuscous; basal joint fuscescent, with a tuft of golden hair at the apex above, and beneath with a fringe of strong

black hair ; *vertex* blackish, clothed with blackish and golden-yellow hairs intermingled, springing from a rounded tubercle on each side ; *maxillary palpi* of the ♂ thickly clothed with golden hairs, among which are a few blackish ones ; in the ♀ the blackish hairs predominate ; *eyes* deep black.

" *Thorax—prothorax* clothed with golden-yellow hairs ; *meso-* and *metathorax* nearly hairless, blackish fuscous.

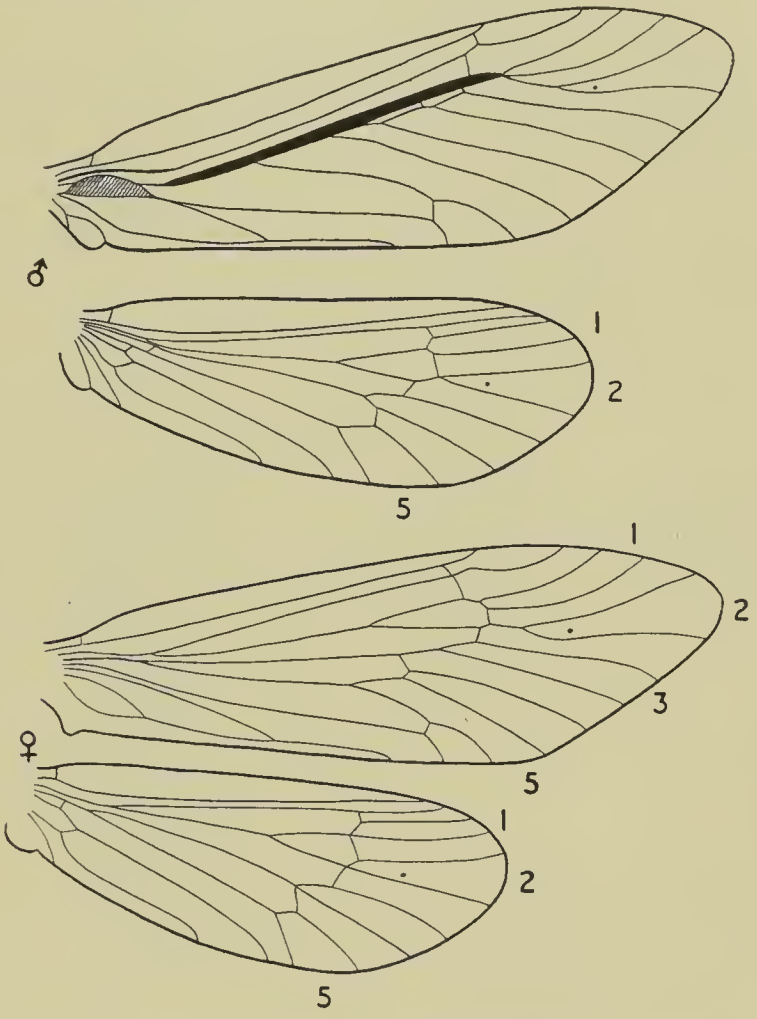

Fig. 15.—*Pycnocentria evecta* McLachlan. ♂♀ wings.

" *Wings—anterior wings* pale-greyish, very densely clothed with short, golden-yellow hairs, in which are intermingled a few blackish ones ; the depressed fold-like line in the ♂ not conspicuously darker ; fringes grey, mixed with blackish : *posterior wings* smoky-grey, with dark blackish-grey pubescence, iridescent ; fringes grey.

" *Legs* yellow ; tibiae and tarsi, especially the two anterior pairs, clothed with blackish hairs.

"*Abdomen* reddish-brown ; appendices yellow. In the ♂ the antepenultimate ventral segment bears a broad flattened obtuse lobe, which is brown at its base, and yellow at the apex ; from the last dorsal segment protrudes a small, elongately triangular, subobtuse, yellow lobe ; the app. sup. are very small and indistinct ;

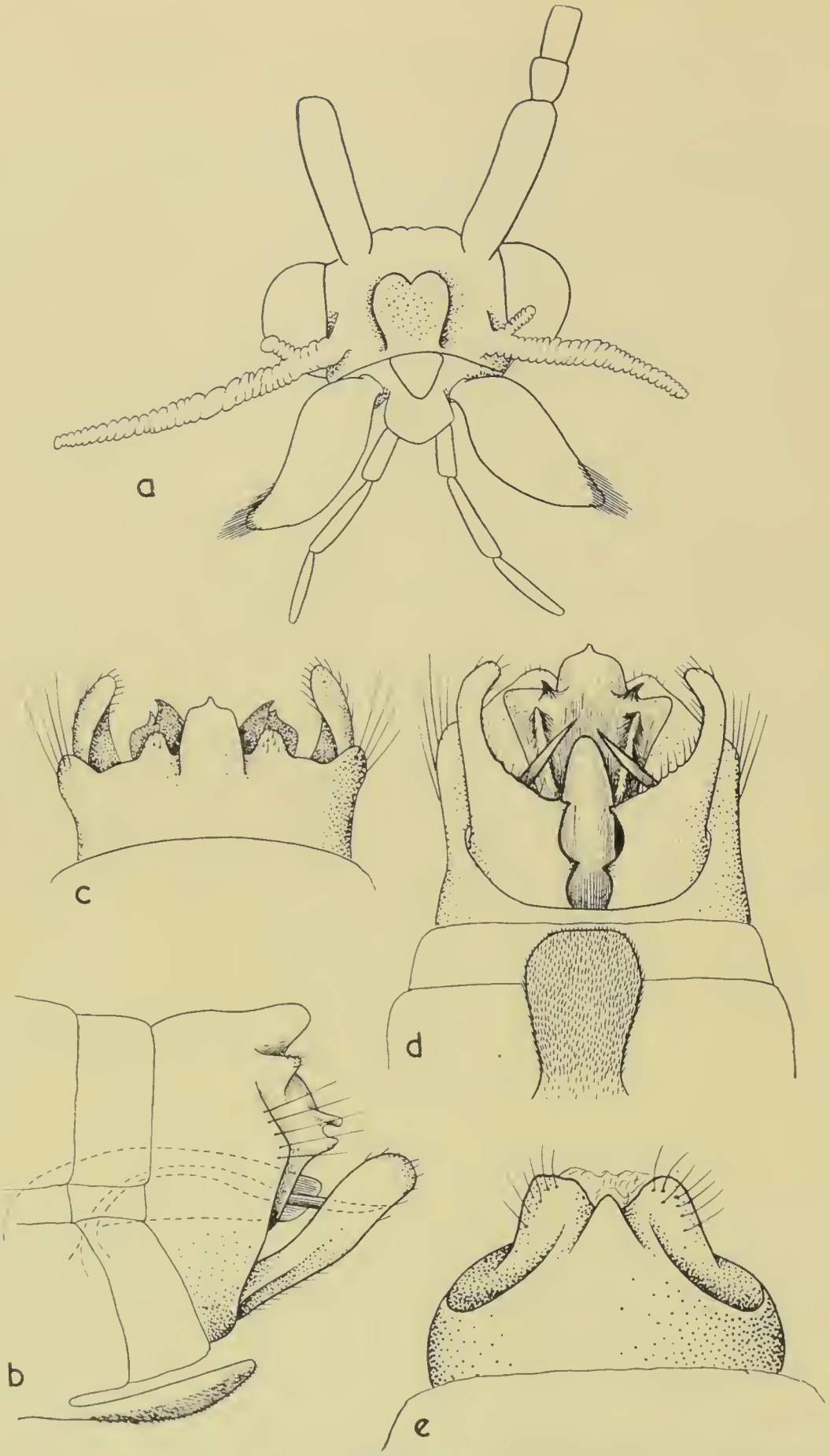

FIG. 16.— *Pycnocentria evecta* McLachlan. *a*, ♂ head from front ; *b*, ♂ genitalia, lateral ; *c*, dorsal ; *d*, ventral ; *e*, ♀ genitalia, dorsal.

app. inf. long, curved up against the lateral margins of the last segment, the tips being slightly directed downwards ; there are also two fine needle-shaped penis-sheaths, and the penis itself appears to be short and truncated. In the ♀ there is no ventral lobe ; the apex of the abdomen is truncated, containing a nearly circular cavity.

" Long. corp. 2–2¼‴ ; exp. alar. 7–8‴.

" Christchurch, Canterbury (Fereday) 3 ♂ 1 ♀."

[An example from the cotype series, a ♂ with one pair of wings denuded, and labelled type by McLachlan, is hereby selected as the *type*.—D. E. K.].

The original description of the genitalia of this species is not altogether satisfactory. I therefore take this opportunity of redescribing the species in respect to these parts.

Genitalia, ♂.—Dorsal margin of the ninth segment produced and raised at its centre in a small, somewhat quadrate process, with the apex slightly produced at the centre of its apical margin ; the remaining part of the margin with a pair of blunt projections on each side of the centre. The underside of the dorsal plate is produced in a pair of strongly chitinized hooks, which appear to be either attached, or closely adjacent to a sleeve-like penis-cover. Penis short, fleshy, with a pair of long, spine-like sheaths. Inferior appendages from beneath very broad, sinuous and upturned from the side ; from beneath, inner margins strongly and widely serrate at the base, apical halves concave, so that the apices are rather slender and incurved. A very large, spatulate process, covered with minute hairs or spines to the seventh ventral segment.

Genitalia, ♀.—From above, the terminal tergite bears two rounded plates with a saucer-like depression at the base of each. The characters of the genitalia are rather indeterminate ; no ventral process.

The perfect insect occurs during the months of November to February. Examples in the British Museum (N.H.) from Christchurch, Wellington, Cass and Temuka.

Hudson gives the following account of the biology of this species :

" The larva is very abundant in many rivers and streams, but appears to prefer those flowing through open country, with a rather sluggish current and muddy bottom. It constructs a small, cylindrical and slightly curved case of secreted material, entirely covered with extremely minute stones and particles of sand. This case is usually greyish-green in colour, the greenish tinge being no doubt due to the presence of a certain amount of living vegetable matter amongst the sand grains attached to it. These cases occur in the streams throughout the year. In the late autumn and winter they are very small ; cases taken in June being less than ⅛ inch in length, although they are quite as numerous then as at any other time. During the spring the larvae gradually increase in size, and enlarge their cases accordingly, about the end of November ; when most of the streams have very much diminished in volume and rapidity of current, these insects speedily develop. They probably feed on vegetable matter, and the green slime-weed, which always grows profusely in slow-running streams, forms, no doubt, their chief article of diet. This caddis-worm constitutes an extremely important item in the food supply of trout, very large numbers of the cases and their contained larva being found in the stomachs of these fish.

"The length of the larva of this insect, when extended, is about $\frac{3}{16}$ inch. The head is large, very broad, but short, blackish-green, with a few irregular paler green marks. The prothorax is elongate, pale olive-green, with four round black dorsal spots. The rest of the body is very pale olive-green, marbled with darker olive-green, especially on the back. The surface is much wrinkled. Anterior legs short moderately stout, with a very sharp single claw; middle and posterior legs much longer and slenderer, apparently used exclusively in walking. Anal eminences very obtuse, each furnished with about nine very stout bristles, and a minute but very stout claw. Usual dorsal hump very small; lateral humps also small. There are traces of a few irregular, branching, white filaments.

"As soon as this larva is mature it fastens its case to a large rock or stone in the stream, and, when possible, always selects for this purpose a crevice in the stone. A large number of larvae will frequently attach their cases very close together in such a situation, and it is most difficult either to detect or remove the cases when they are thus protected by the overhanging edges of the crevice. Both ends of the case are, of course, closed with the usual network, so that the enclosed pupa is securely protected from all enemies.

"The perfect insect appears from November till February. It must be very common, although it is not often seen, owing no doubt to its small size, inconspicuous appearance, and nocturnal habits. I observed it very abundant on the banks of Lake Pukaki at evening dusk, and further investigation will probably reveal its presence in most places situated in the vicinity of water."

Pycnocentria forcipata sp. n. (fig. 17.)

Insect small, black or dark golden-brown; the fold in the anterior *wing* of the male not so well-defined, nor extending so far, as in *P. funerea*, which the insect superficially resembles. The *genitalia* are quite distinctive.

Genitalia, ♂.—Apical margin of the ninth tergite straight; dorsal plate broad, with the apical angles produced in long, downturned processes; from above, the angles are divergent and acute; there is a minute, pointed wart towards each basal angle and possibly a projecting shelf midway along the lateral margin (the dorsal plate is mutilated in the cleared example under examination and the drawing has been, to a certain extent, corrected from a dried specimen). Penis large and fleshy, downturned; in a cleared example can be seen a pair of upcurved hooks within it. Inferior appendages, from the side, long and slender, bent upwards nearly at right angles midway; from beneath, calliper-shaped, with the apices truncate and turned over; there is a projection with a serrate apex on the inner margin towards the base. No ventral process.

Length of the anterior wing, ♂, 5 mm.

NEW ZEALAND: Gollan's Valley, 6.xii.1932, 1 ♂ (*Type*); Sinclair Head, 21.ix.1933, 2 ♂; Wilton's Bush, Wellington, x–xi.1934, 1 ♂. G. V. Hudson.

Type is a microscope preparation.

This species differs from the foregoing species in the form of the inferior appendages.

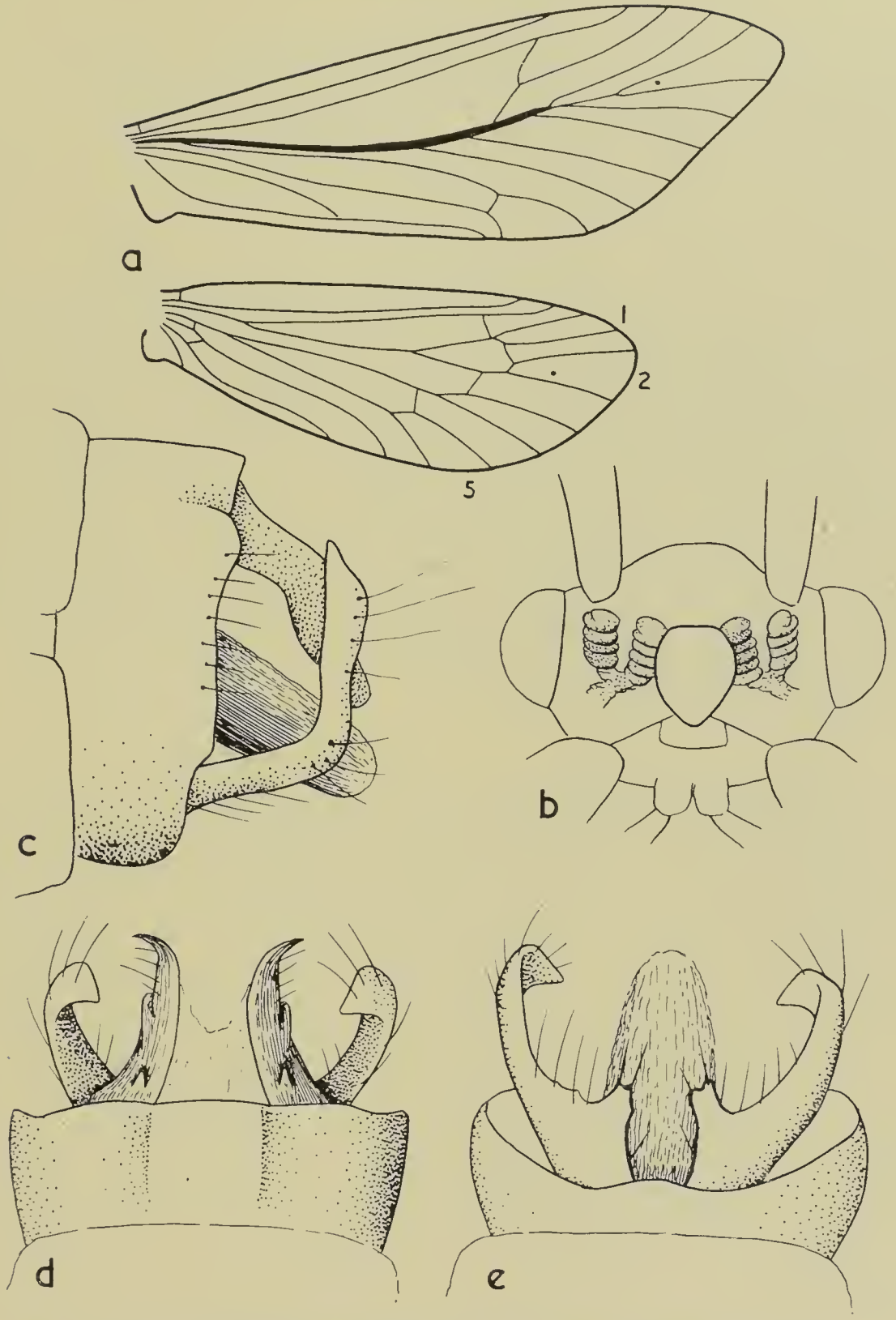

FIG. 17.—*Pycnocentria forcipata* sp. n. ♂. *a*, wings ; *b*, head from front ; *c*, genitalia, lateral ; *d*, dorsal ; *e*, ventral.

Pycnocentria funerea McLachlan (fig. 18).

Pycnocentria funerea McLachlan, 1866, *Trans. ent. Soc. Lond.*, (3) **5** : 252, pl. 18, fig. 1.
Pycnocentria funerea McLachlan, 1868, *Journ. Linn. Soc. Lond. Zool.*, **10** : 211.
Pycnocentria funerea McLachlan, 1873, *Ann. Mag. N. H.*, (4) **12** : 39.
Pycnocentria funerea Hutton, 1899, *Trans. N. Zeal. Inst.*, **31** : 238–239.
Pycnocentria funerea Hudson, 1904, *N. Zealand Neur.* : 67–68.
Pycnocentria funerea Ulmer, 1907, *Gen. Insect.*, **60a** : 98.

McLachlan describes the species as follows:

"Antennae blackish-fuscous. Head and thorax dark chestnut-brown, clothed with blackish hairs. Palpi thickly clothed with blackish hairs. Anterior and posterior wings dark smoky-fuscous, almost black, the folds in the male conspicuously darker; in the former there is a small whitish spot at the anal angle. Anterior legs wholly greyish-ochreous; intermediate and posterior legs with fuscous femora and tibiae, and ochreous tarsi. Abdomen blackish-fuscous, the divisions of the segments paler. In the male the upper margin of the last abdominal segment is produced in the middle into a long, flattened lobe, dilated at the base, but afterwards attenuated, and obtuse at the apex; from under this lobe project the curved points of the app. interned.; app. sup. not apparent, perhaps concealed under the lobe; app. inf. double, consisting of two branches, the upper long, flattened, hairy and somewhat obtuse, the lower longer, and ending in an acute point; penis long and exserted, perhaps provided with upper and under sheaths. The female possesses a short obtuse lobe on the ventral surface of the antepenultimate segment.

"Long. corp. 2 lin.; exp. alar. 6–6½ lin.

"Habitat in Nova Zealandia.

"In Mus. Brit."

To McLachlan's description of the genitalia I would add the following:

Genitalia, ♂.—Apical margin of the ninth tergite produced in a long spatulate plate with two widely divergent processes arising beneath its apex; from the side, each process is directed tailward and downward, upper margin sinuous, lower convex; from above, the outer margin towards the apical half is serrate. Penis long, with two pairs of strongly chitinized, furcate sheaths, one pair lying above, and the other below, towards its apical half. Inferior appendages branched, the two branches long and slender; lower branches from beneath, curving strongly outward, but with the apices approaching each other and then diverging slightly; upper branches shorter than the lower, from the side a little stouter; they arise towards the base and are directed upward and tailward; side pieces of the ninth segment strongly produced in rounded processes bent inwards; the centre of the ventral margin is also strongly produced; no ventral process.

Genitalia, ♀.—The terminal segment bears two small, somewhat inturned processes; the only other noticeable character is a stout process to the seventh sternite.

There is a series of seven examples in the British Museum (N.H.), 3 males and 4 females. Of these, one male has been entirely mounted in canada balsam and I designate this male as the *type* of the species. In addition, there

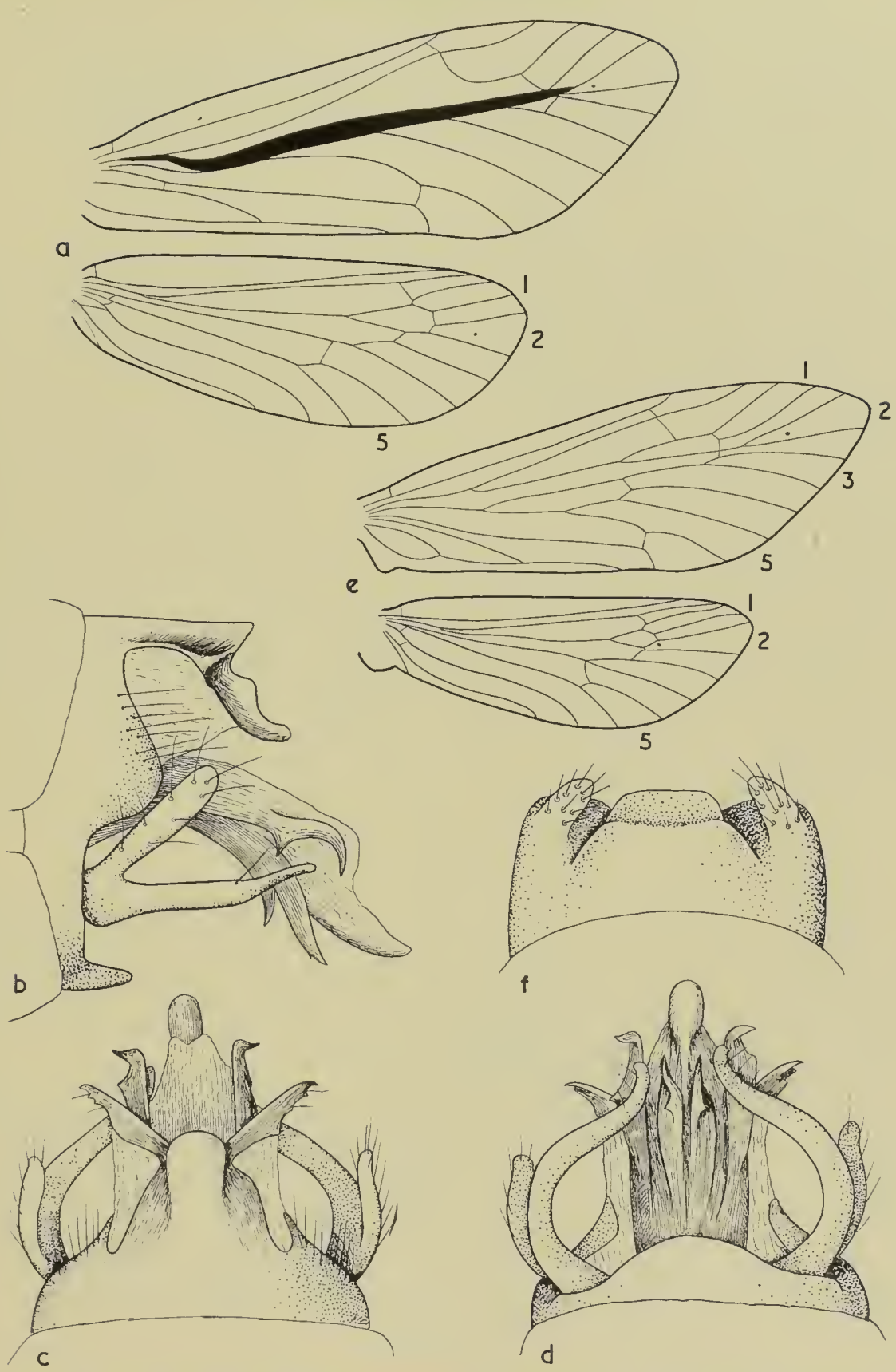

FIG. 18.—*Pycnocentria funerea* McLachlan. *a*, ♂ wings ; *b*, ♂ genitalia, lateral ; *c*, dorsal ; *d*, ventral ; *e*, ♀ wings ; *f*, ♀ genitalia, dorsal.

are examples from Gollan's Valley, South Karori, Wellington and Tarawera. The species is on the wing from October to March. Hudson records :

"It usually frequents the margins of streams in rather open country, and is often fairly common in such situations."

Matasia Mosely.

Matasia Mosely, 1936, *Proc. Zool. Soc. Lond.*, 1936 : 411.

This genus was erected to take a small, black Sericostomatid, allied to *Pycnocentria evecta* McLachlan, according to the neuration of the posterior wing. The *anterior wing*, however, differs widely in neuration from that in other genera in the family, though it shares with *Helicopsyche* the feature of an area covered with clavate hairs.

In the *posterior wing* the radius terminates in the first apical sector, and forks nos. 1, 2 and 5 are distinct, but although several forks must be present in the anterior wing, having regard to the position of what I consider to be the corneous point, I hesitate to name them ; there are two folds in this wing. *Antennae* with the basal joint large and bulbose, the next joint small, about the same length as the following joints, but a shade wider. *Ocelli* wanting ; attached to the lower part of the *frons* is a broad, U-shaped process, somewhat resembling that in *Coenoria boera*. *Maxillary palpi* membranous, probably three-jointed, first two joints much dilated and hardly divisible, terminal joint short, slender, with a much drawn-out and acute apex ; labial palpi with all the joints more or less equal in length. *Spurs* 2, 2, 4. A ventral process to the antepenultimate segment.

Type species.—*Matasia satana* Mosely, 1936.

Matasia satana Mosely (figs. 19, 20).

Matasia satana Mosely, 1936, *Proc. Zool. Soc. Lond.*, 1936 : 411–413, figs. 42–48.

Head clothed with black hairs : oculi black. *Palpi* as in the generic description. *Antennae* dark fuscous, no conspicuous annulations. *Legs* pale fuscous, paler at the bases of the tarsal joints. *Wings* dark grey, covered with short, silky, light fuscous pubescence, the anterior in the male with a large area in the centre, extending towards the base, covered with short, erect, clavate hairs set on slender stems. *Abdomen* black.

Genitalia, ♂.—Margin of the ninth tergite, from above, produced at its centre in a strongly chitinized, black finger. Beneath this is a long, bifurcate upper penis-cover, each fork having an unpigmented area about midway ; the forks arise from a wide base and terminate in long, slender apices ; on the upper surface, arising at the edge of the unpigmented area, are two small processes. Penis short, straight and fleshy. Inferior appendages large, ear-shaped ; lower margins sinuous, a short, serrated ridge on each inner surface towards the base ; seen from above, they arise from very slender stems and are widely outspread ; from the side they are narrow ; lobe of the "ear" narrow and downwardly produced. Margin of the ninth sternite strongly

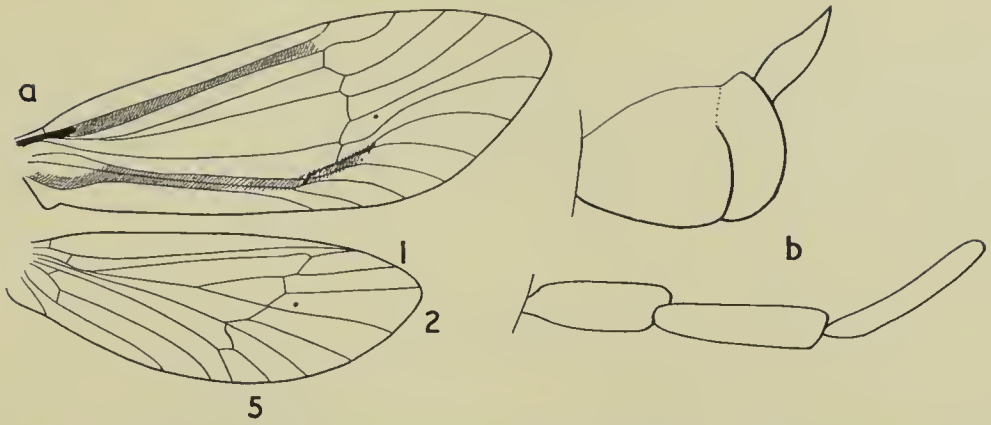

FIG. 19.—*Matasia satana* Mosely. ♂. *a*, wings; *b*, maxillary and labial palpi.

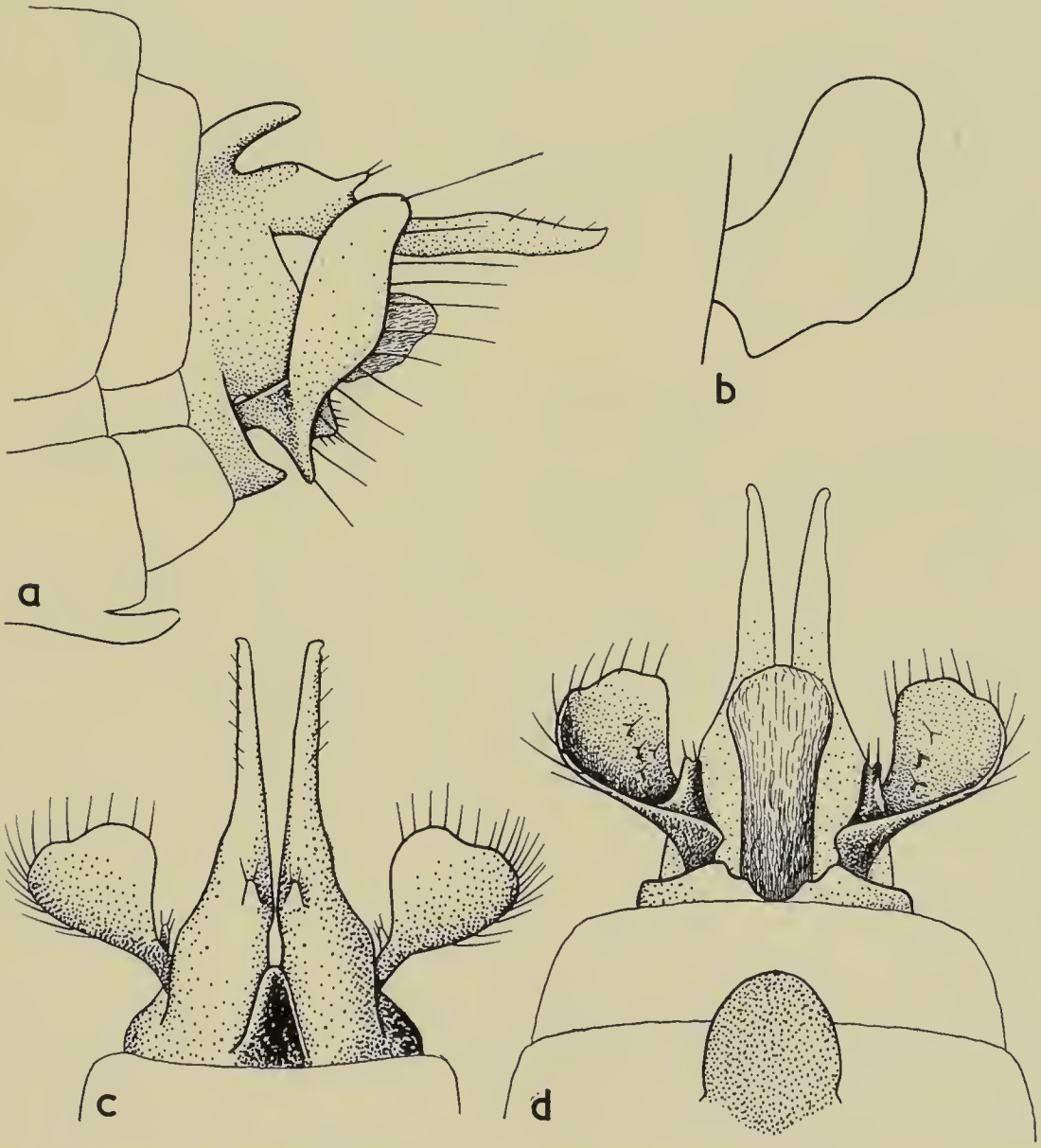

FIG. 20.—*Matasia satana* Mosely. ♂. *a*, genitalia, lateral; *b*, inferior appendage from in front; *c*, genitalia, dorsal; *d*, ventral.

chitinized and excised at the centre ; a strong rounded process to the antepenultimate segment.

Length of the anterior wing, ♂, 5·5 mm.

TASMANIA : Miena, 3300 ft., xii.1929, H. M. Stephen, 1 ♂ ; Miena, xii.1930, 1 ♂ (*type*), C. Parker.

Type, ♂, mounted in balsam.

Hampa gen. n.

Ocelli absent. *Spurs* 2, 2, 4. *Antennae* with the basal joint as long as, or slightly longer than, the width of the head between the oculi, second joint short ; remaining joints each about twice the length of the second. *Maxillary palpi*, ♂, two-jointed ; basal joint long, terminal joint very short. On the *frons* is a two-lobed process, with a small, membranous but comparatively wide process on each side, no doubt a scent-organ. In the anterior *wing* forks nos. 1, 2, 3 and 5 present ; posterior with forks nos. 1, 2 and 5 ; radius terminates in first apical sector ; discoidal cell present in both wings. A large, spatulate process to the seventh sternite.

Type species.—*Hampa patona* sp. n.

This genus is related to *Matasia* Mosely and *Costora* Mosely. It may be distinguished from the former by the presence of a groove only in the fore wing, ♂, and from the latter by the relatively shorter footstalk to the discoidal cell in the anterior wing, ♂.

Hampa patona sp. n. (figs. 21, 22).

Insect with greyish yellow *wings*, the anterior, in the ♂, with a groove, filled with black scales, extending from the base to the apex of the wing with the extremity curving slightly upwards.

Genitalia, ♂.—From above, distal margin of the eighth segment fringed with long, stiff hairs : the margin of the ninth is produced at its centre in an elongate triangle, with a minute excision at the apex ; on each side is the strongly produced margin of the ninth segment ; from beneath the apices of these produced margins is seen what is probably the upper penis-cover, which is divided in an upper and a lower portion. From above, the upper part appears as a pair of rather narrow, outwardly and distally directed branches of the lower part, which is large and conforms with the direction of the upper ; in effect, the cover consists of a pair of divergent forks with branches on the upper surfaces ; from the side, the upper part is separated from the lower by a deep, rounded excision. There is a pair of short penis-sheaths one each side of a membranous penis, which is furnished at its apex with a pair of thorn-like, outwardly and distally directed spurs, with two or three others embedded in the membrane ; lower penis-cover large, forming a trough beneath the penis, with a pair of short, lateral spurs towards the apex. Inferior appendages bifurcate, forks widely separated at the base, the upper, as seen from the side, much wider than the lower, which is the longer. The lower margin of the

ninth segment is produced at its centre in a short, arched, transparent tongue, excised at the apex, as seen from beneath.

Length of the anterior wing, ♂, 5·5 mm.

AUSTRALIA : New South Wales, Hampton, i.1918, R. J. Tillyard, 3 ♂.

Type, ♂, in form of microscope preparation.

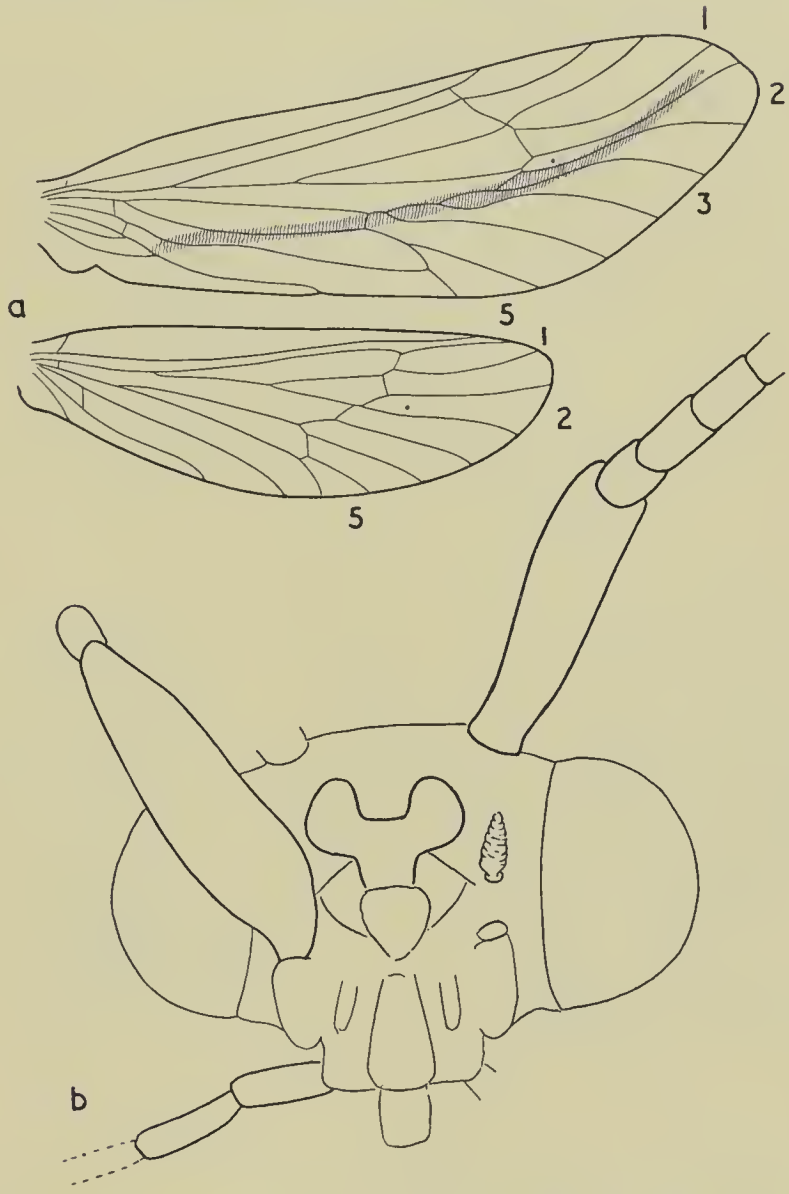

FIG. 21.—*Hampa patona* gen. sp. n. ♂. *a*, wings ; *b*, head from in front.

Costora Mosely.

Costora Mosely, 1936, *Proc. Zool. Soc. Lond.*, 1936 : 403–404.

Insects of medium size. *Maxillary palpi* two-jointed ; basal joint strongly dilated towards its apex, terminal joint slightly curved and clothed with a brush of very coarse, long hairs. Labial palpi with the basal joint shorter

than the second ; second joint about half as long again ; third joint slightly longer than the basal. *Ocelli* absent. *Antennae* short and stout ; basal joint large ; second joint rather shorter than each of the remaining joints ; anterior *wing* in both sexes with forks nos. 1, 2, 3 and 5 present ; a small fold at the base

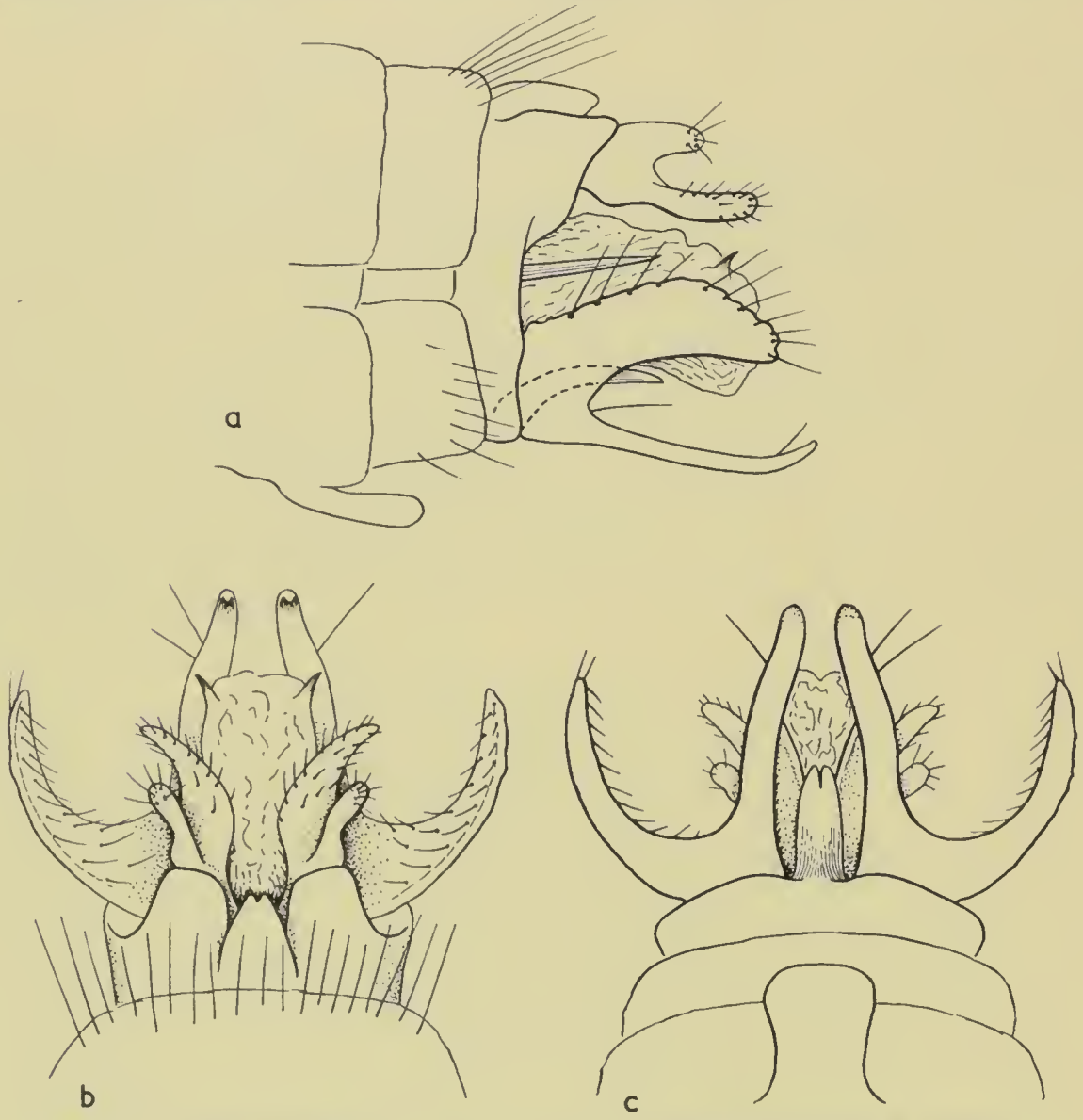

FIG. 22.—*Hampa patona* gen. sp. n. ♂. *a*, genitalia, lateral ; *b*, dorsal ; *c*, ventral.

of the radius in the male ; in the posterior wing forks nos. 1, 2 and 5 present ; discoidal cell present in both wings, short and triangular in each. *Spurs* 2, 2, 4.

There is a scent-organ in the male situated on the *frons*, varying in different species. A scent-organ nearly similar in pattern is found in the New Zealand species *Pycnocentria evecta* McLachlan.

Type species.—*Costora iena* Mosely, 1936.

KEY TO SPECIES OF *Costora*, MALES.

1. Anal vein in anterior wing very short . . . . . *C. delora* sp. n. (p. 49).
–. Anal vein in anterior wing normal, reaching nearly to anastomosis . . . 2.
2. Ventral process small and short . . . . . *C. iena* Mosely (p. 47).
–. Ventral process large and long . . . . . *C. rotosca* sp. n. (p. 49).

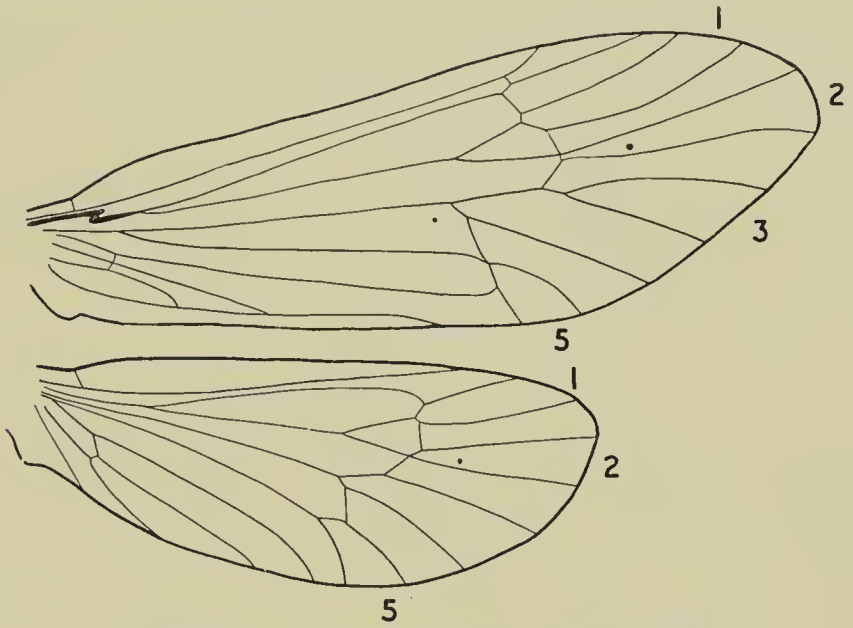

FIG. 23.—*Costora iena* Mosely. ♂. Wings.

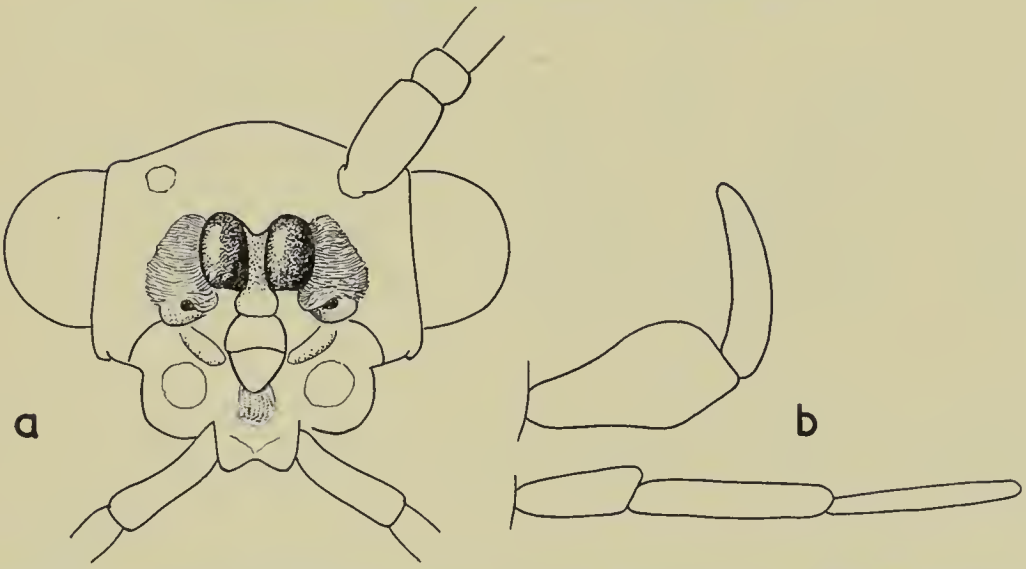

FIG. 24.—*Costora iena* Mosely. ♂. *a*, head from in front, maxillary palpi omitted; *b*, maxillary and labial palpi from side.

Costora iena Mosely (figs. 23–25).

Costora iena Mosely, 1936, *Proc. Zool. Soc. Lond.*, **1936** : 403–404, figs. 16–21.

Head fuscous, with fuscous hairs and with two conspicuous warts bearing tufts of long hairs towards the oculi. *Antennae* fuscous; basal joint darker

than the remaining joints. Scent-organ consists of two rounded and strongly chitinized plates partly detached from the *frons*, on each side of which is a membranous, extensile process with a short, membranous branch on its inner side. *Wings* pale brownish grey with short, silky pubescence. Other characters given with the generic description.

Genitalia, ♂.—Margin of the eighth tergite fringed with a deep belt of long, coarse hairs; on the anterior dorsal segments there are rounded patches

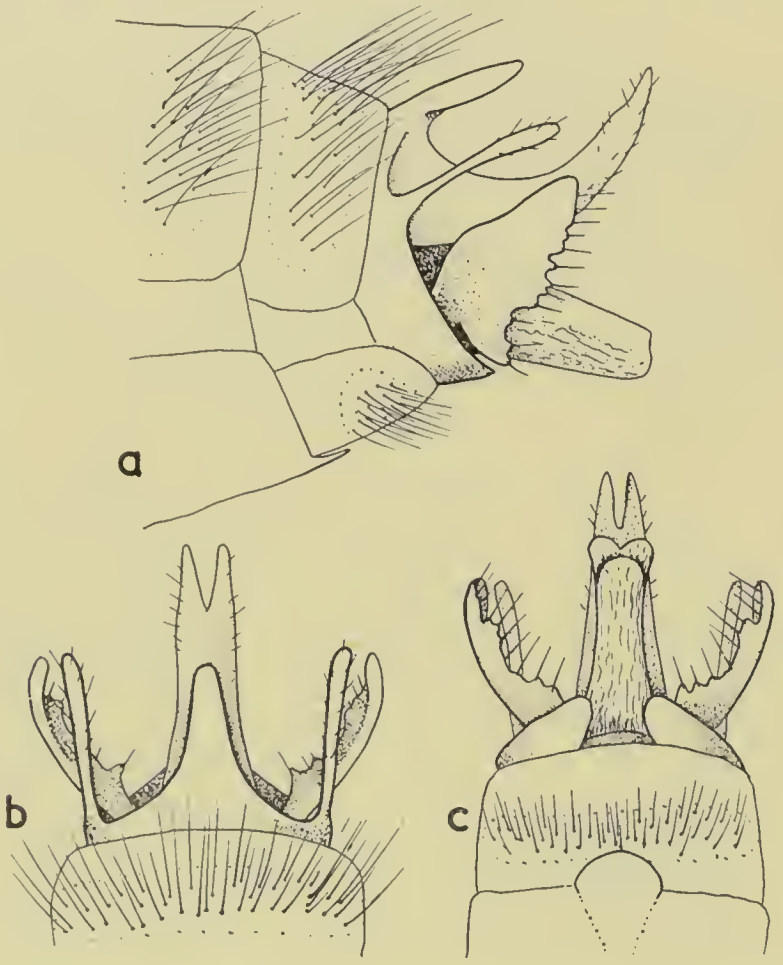

Fig. 25.—*Costora iena* Mosely. ♂. *a*, genitalia, lateral; *b*, dorsal; *c*, ventral.

similarly clad. Dorsal margin of the ninth segment bearing three long processes, one in the centre; the other two, which are slightly longer and more slender, arise from the lateral margins towards the upper half. From the side, the apices of these two lateral processes are slightly dilated. The ventral margin of the ninth segment is interrupted at the centre, leaving two rather stout, longish lobes with rounded apices, inclining along the margin of the segment and separated from each other by a broad, rounded plate; this structure is visible only in cleared examples. There is a large upper penis-cover, apex bifurcate as seen from above and beneath; from the side, broad at the base, narrowing to an acute apex and curving upward; its upper margin

continues upward to form the lower margin of the central process of the ninth tergite and is deeply concave. Penis stout, directed slightly downward, apex, from above, excised to form two rounded lobes, but the lower surface rounded and entire. Inferior appendages from the side, triangular, broad, as long as the lateral processes of the ninth segment ; upper margins sinuous, lower strongly serrate. There is a pear-shaped process or plate covered with minute setae, closely adpressed to the antepenultimate ventral segment, with its distal margin scarcely outstanding so that it is barely visible from the side ; there is also a strongly chitinized patch, covered with long hairs, in the centre of the penultimate ventral segment.

Length of the anterior wing, ♂, 11 mm. ; ♀, 12 mm.

Tasmania : Great Lake, R. Shannon, xii.1934–i.1935 ; Miena, xii.1930. C. Parker.

Type, ♂, a microscope preparation with the wings mounted dry, from Great Lake, R. Shannon.

Costora delora sp. n. (fig. 26).

Insect yellowish. *Frontal process* rather narrow and deeply excised. *Anterior wing* ochreous, with a very conspicuous group of hairs arising from near the lower margin at the extreme base and directed upward to form a well-defined, square patch. In this wing, between the radial sector and the media, perhaps based on the latter, runs a shallow groove clothed with thickened hairs or scales. When denuded, it may be seen that the membrane is white in this area. The anal vein is much shorter in *delora* than in the other species in the genus ; in the posterior wing the costa is folded for the greater part of its length to constitute a pocket filled with long hairs.

Genitalia, ♂.—From above, the margin of the ninth segment is produced in a very slender, pointed process, beneath which lies the upper penis-cover, which is very long and cleft as far as the process of the ninth segment. At the base, on each side, is a small superior appendage. Penis arched, so that the dilated apex lies between the bases of the inferior appendages ; no apparent penis-sheaths or lower penis-cover. Inferior appendages large, irregularly-shaped, distal margin furnished with long, stout, downwardly directed spines. Ventral margin of the ninth segment bearing a pair of long, widely-spaced, slender processes ; process of the seventh sternite large and spatulate, its surface covered with minute teeth ; the seventh sternite here is pigmented in a lunate patch giving the appearance of a wide, concave excision with the process arising in the centre ; the remainder of the distal margin is strongly pigmented.

Length of the anterior wing, ♂, 7 mm.

Tasmania : Deloraine, 25.xii.1884 (from the McLachlan Collection), 1 ♂, (*type*), with head and abdomen mounted in balsam.

Costora rotosca sp. n. (figs. 27–29).

Insect (collected in fluid) brownish. In the ♂ anterior *wing* there is a fold at the base along the inferior cubitus. On the *thorax*, on each side of the median

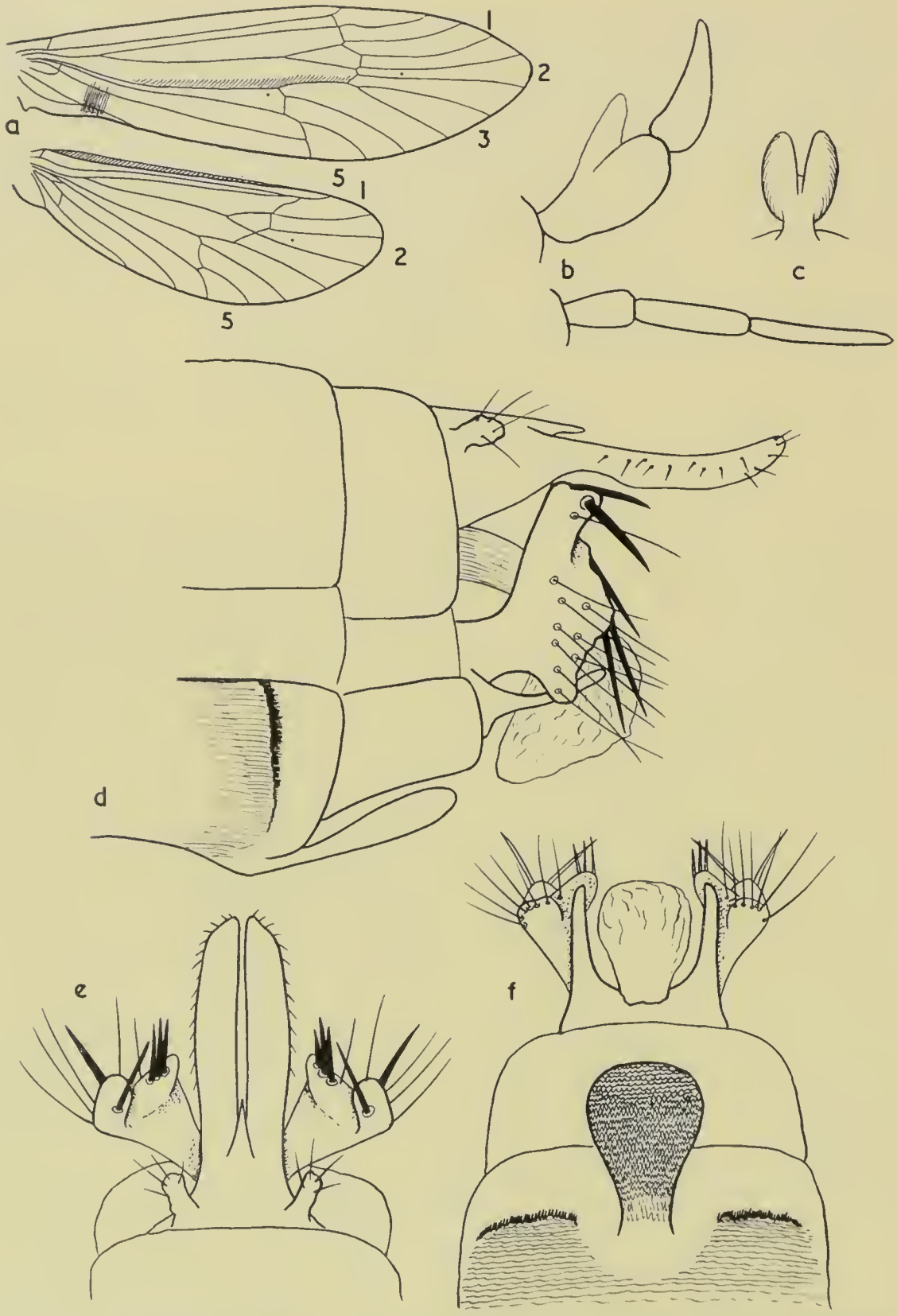

FIG. 26.—*Costora delora* sp. n. ♂. *a*, wings; *b*, maxillary and labial palpi; *c*, frontal process; *d*, genitalia, lateral; *e*, dorsal; *f*, ventral.

line, is an elongated, yellow patch. *Antenna* with the basal joint rather long ; next joint shorter than the remaining joints ; on the *frons* is a raised structure, possibly a scent-organ, shaped as a broad " Y " with a truncated stem. *Maxillary palpi* rather membranous towards the apices of the joints, a short process arising from the upper surface of the basal joint, bearing a tuft of black hairs ; terminal joint short.

Genitalia, ♂.—Dorsal margin of the ninth segment produced at its centre with a trifid apical margin. On each side of the central process and arising from the upper lateral margin is a small process with dilated apex. Below this is an upper penis-cover, consisting of a pair of widely-separated processes forming a " V," in the cleft of which is a membranous penis lying between a

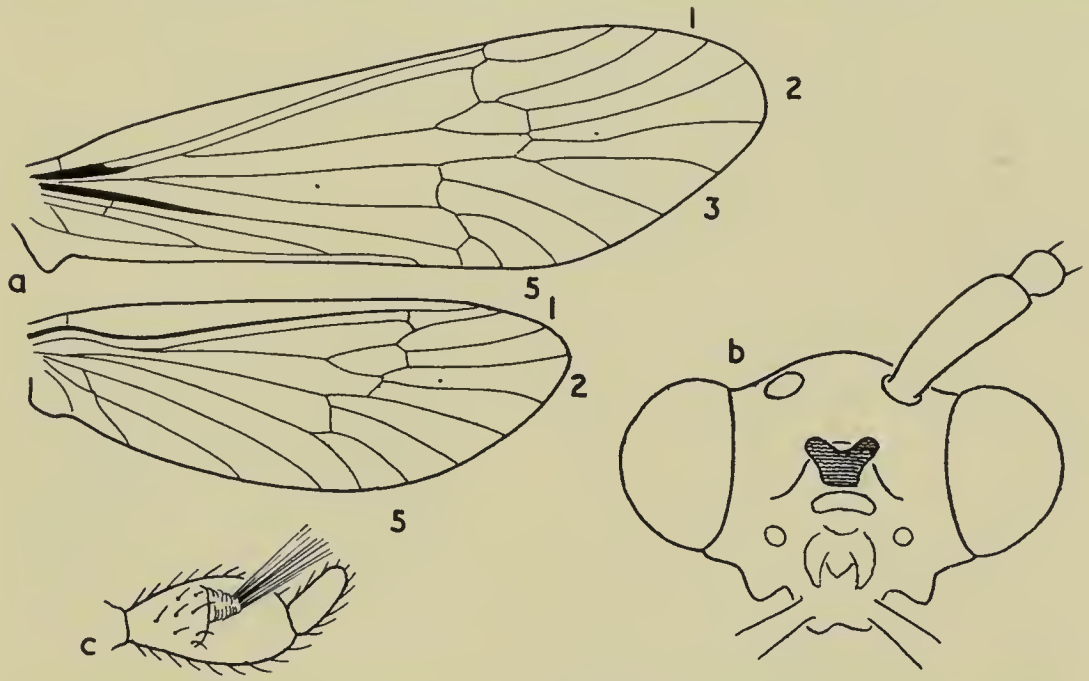

Fig. 27.—*Costora rotosca* sp. n. ♂. *a*, wings ; head from front, maxillary palpi omitted ; *c*, maxillary palp, upper surface.

pair of very stout, divergent sheaths with truncate apices. Inferior appendages, from the side, narrow, arching upward close to the edges of the ninth segment. Outer margin at the base, bearing numerous long, blunt teeth, arranged some singly, some in groups ; at the extreme base is a pair of very long spines. A spatulate process to the seventh sternite, its surface densely covered with minute teeth.

Genitalia, ♀.—Abdomen terminates in a pair of stumpy processes situated on each side of a central excision ; distal angles of each produced, the outer the longer. The fifth sternite bears a pigmented design, a slightly concave line with produced lateral margins.

Length of the anterior wing, ♂, 7 mm. ; ♀, 7·5 mm.

Tasmania : J. W. Evans, 2 ♂, 1 ♀.

Type, ♂, paratype, ♀, in form of microscope preparations, paratype, ♂, in fluid.

C. rotosca may be distinguished from the type species by its larger spatulate process to the seventh sternite, and from *C. delora* by its longer anal vein in the anterior wing.

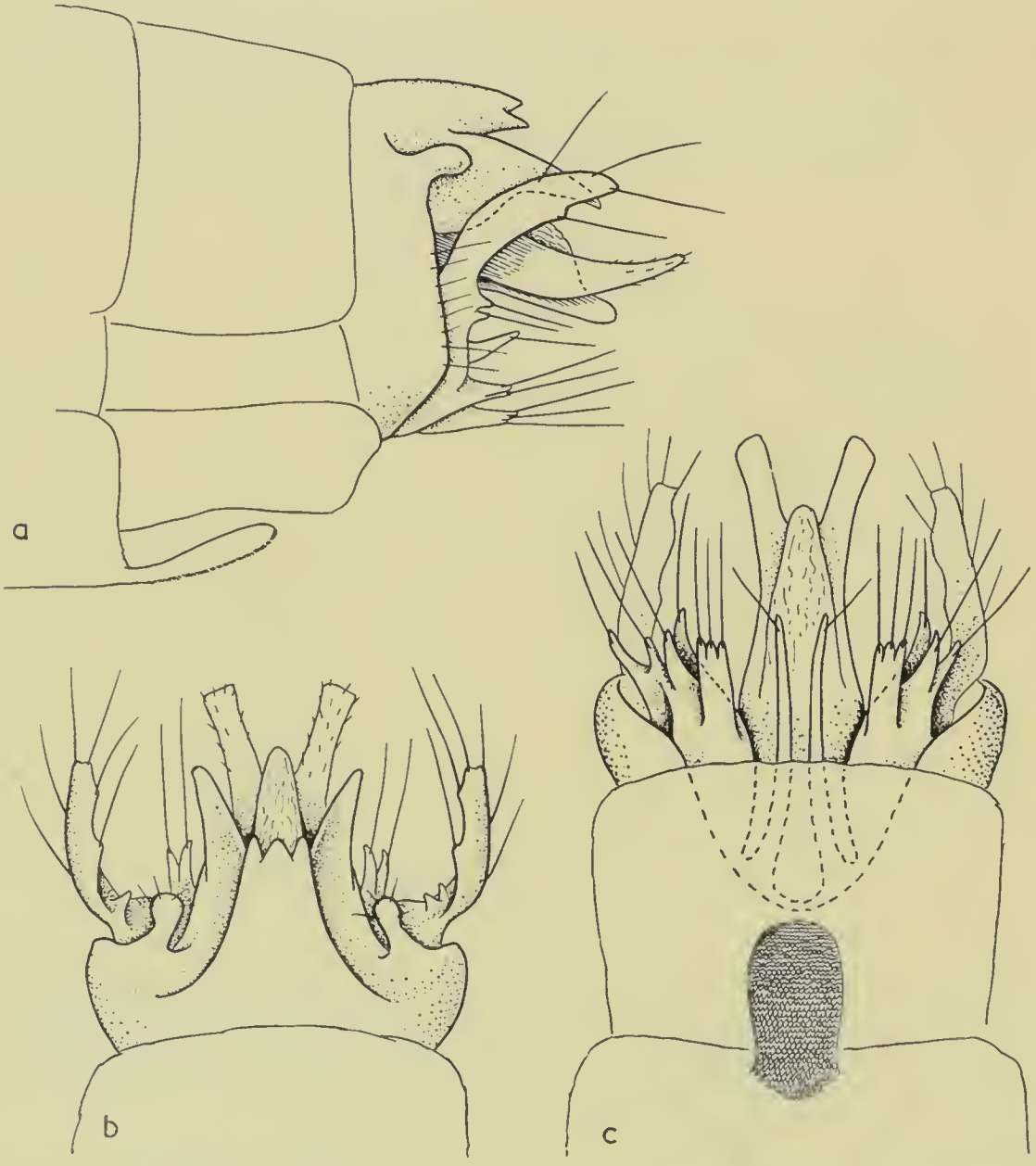

FIG. 28.—*Costora rotosca* sp. n. ♂. *a*, genitalia, lateral; *b*, dorsal; *c*, ventral.

Beraeoptera gen. n.

Ocelli absent. *Antennae* with the basal joint about as long as the width of the head between the oculi; second joint small, slightly smaller than each of

the succeeding joints. *Maxillary palpi* two-jointed, basal joint broad ; terminal joint small, narrow and inturned. There is a strong tuft of hairs arising towards the base and extending nearly to the apex, adpressed to the palp. Labial palpi with the second joint the longest. *Wings :* anterior with a callosity at the base resembling that of a *Beraea* species ; it consists of a cap, covering a mass of broadened hairs. Venation of both wings as shown in fig. 30*a*. Spurs 2, 2, 4.

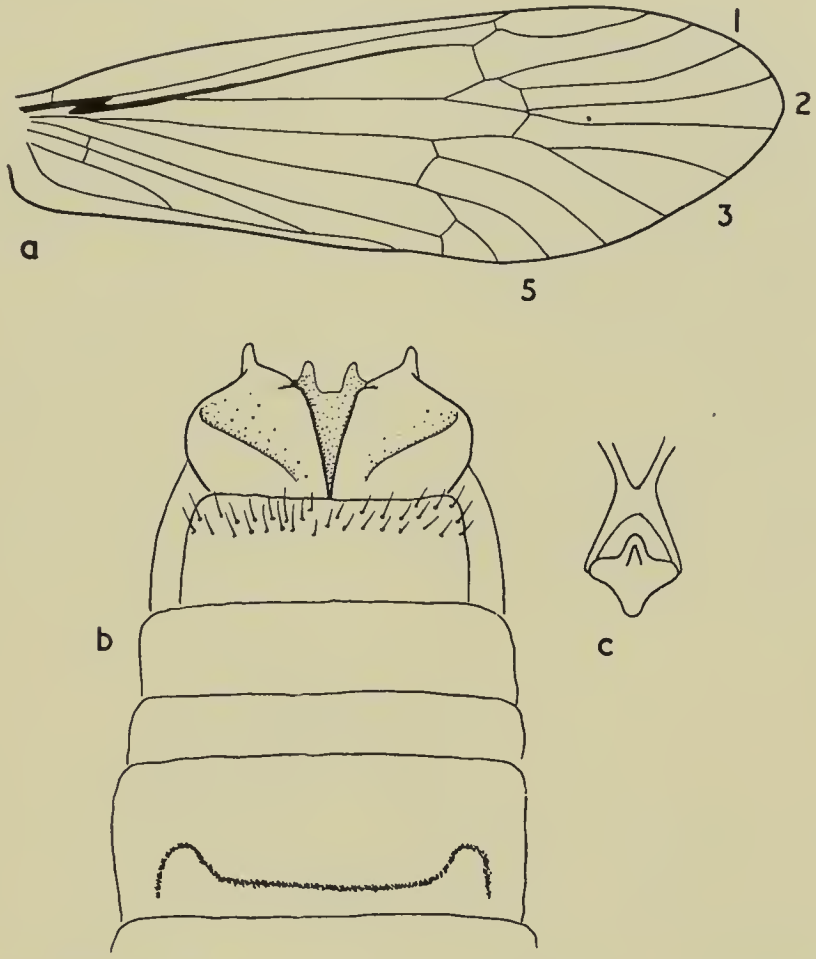

Fig. 29.—*Costora rotosca* sp. n. ♀. *a*, anterior wing ; *b*, genitalia, ventral ; *c*, vaginal structure, ventral.

Type species.—*Beraeoptera roria* sp. n.

The two-jointed maxillary palpi and the callosity at the base of the wing of the ♂ distinguish this genus from *Antipodoecia* Mosely.

Beraeoptera roria sp. n. (figs. 30, 31).

Insect black ; characters other than the genitalia detailed in the generic description.

Genitalia, ♂.—From above, apical margin of the ninth segment produced

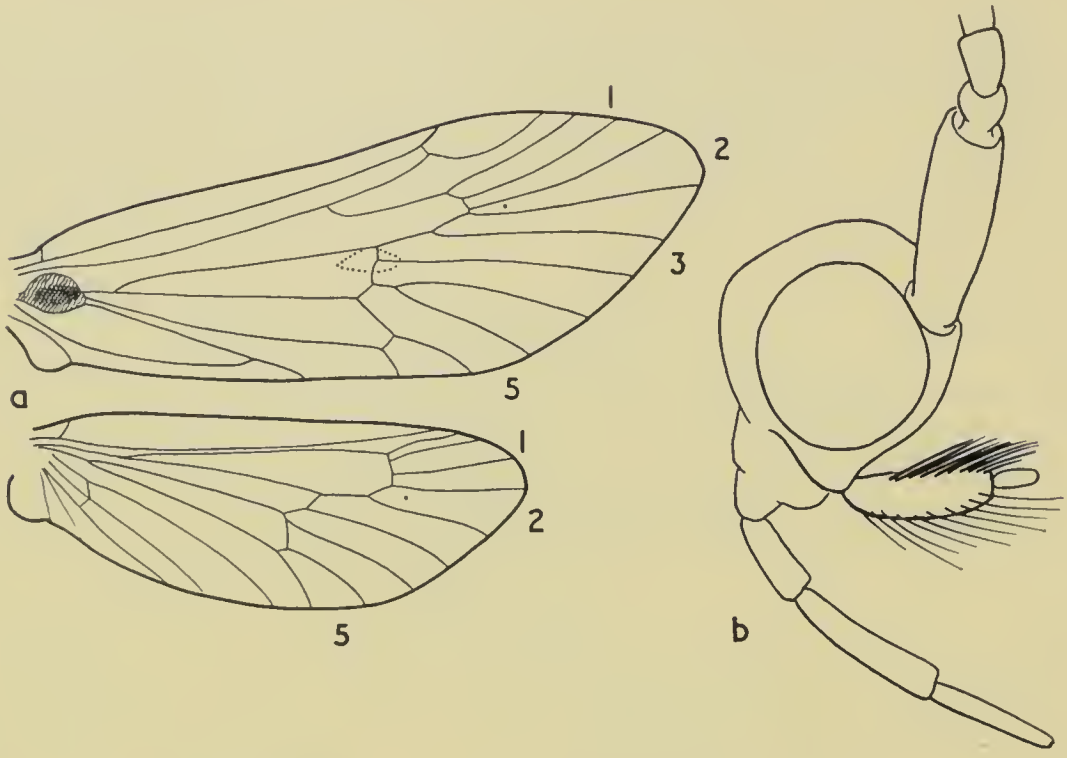

FIG. 30.—*Beraeoptera roria* gen. sp. n. ♂. *a*, wings ; *b*, head, lateral.

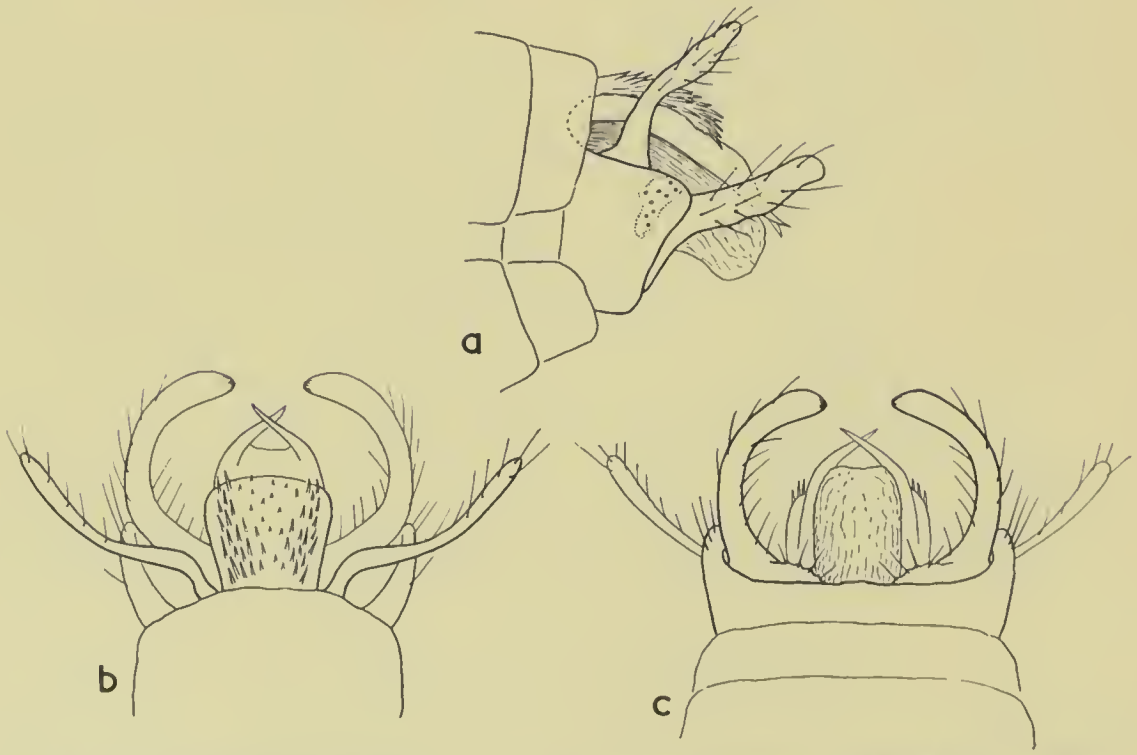

FIG. 31.—*Beraeoptera roria* sp. n. ♂. *a*, genitalia, lateral ; *b*, dorsal ; c, ventral.

in a broad lobe, covered with teeth to leave a narrow bare margin on each side ; this lobe is merged in the upper penis-cover, whose apical margin terminates in a pair of sinuous spines, inclining towards each other, their apices crossing ; superior appendages long and slender, rather widely outstretched in the cleared example under description ; penis obscure, short ; side-pieces of the ninth segment strongly produced and darkly pigmented to enclose an irregularly-shaped, transparent spot ; inferior appendages from beneath, rather stout, calliper-shaped.

Length of anterior wing, ♂, 5 mm.

New Zealand : S. Karori, 29.xi.1937, G. V. Hudson. 1 ♂.

Antipodoecia Mosely.

Antipodoecia Mosely, 1934, *Entomologist*, **67** : 178.

The genus was founded on examples of a single Australian species taken at Ebor, New South Wales, by Dr. A. J. Turner. The insect measures only 8 mm. across the wings, which are narrow and pointed. In the anterior *wings* forks nos. 1, 2 and 3 present and forks nos. 2 and 5 in the posterior. *Antennae* with the basal joint rather large, about half as broad as the head ; second joint short and round ; remaining joints each rather longer than the second. *Ocelli* absent. *Maxillary palpi* upturned in front of the face, three-jointed. Basal joint long and curved, apex somewhat dilated ; intermediate joint as long as the basal and also curved ; terminal joint very short.

Spurs 2, 2, 4. In the median leg there is a row of very short, black spines widely spaced along the outer side of the femur and tibia. These are not seen in the anterior and posterior pair, but all the tarsi are furnished with short, black spines.

Type species.—*Antipodoecia turneri* Mosely, 1934.

Antipodoecia turneri Mosely (fig. 32).

Antipodoecia turneri Mosely, 1934, *Entomologist*, **67** : 178, figs. 1–3.

Head fuscous with light yellowish hairs, mostly situated on the upturned maxillary palpi and forming a mat between the bases of the antennae. *Antennae* dark fuscous with no noticeable annulations. *Palpi* ochraceous. *Wings* covered with fulvous pubescence ; fringes long and fulvous. *Legs* light fuscous, with a series of short, black spines along the outer sides of the median femora and tibiae. Other characters detailed in the generic description.

Genitalia, ♂.—Terminal dorsal segment produced in a long, chitinous hood with a deeply excised apical margin and two small, outstanding processes situated towards the base, and armed at their apices each with two or three bristles. Seen from above there is, at the base of this dorsal process, a triangular patch of minute bristles ; from the side it is parallel-sided with the apex obliquely truncate, the upper apical angle slightly produced upward, the pair of outstanding processes appearing midway between the upper and lower margins. Directly below the hood is the penis, in the form of a pair of strongly chitinized, parallel plates. Inferior appendages bifurcate, rather broad,

directed upward ; upper branch stout, with wide, rounded apex, lower branch much more narrow, tapering to an acute apex ; as seen from the side it is rather longer than the upper branch and curls slightly over it. There is a short, rectangular proeess to the seventh segment partly concealed in a mass of short hairs.

Length of the anterior wing, ♂, 3·5 mm.

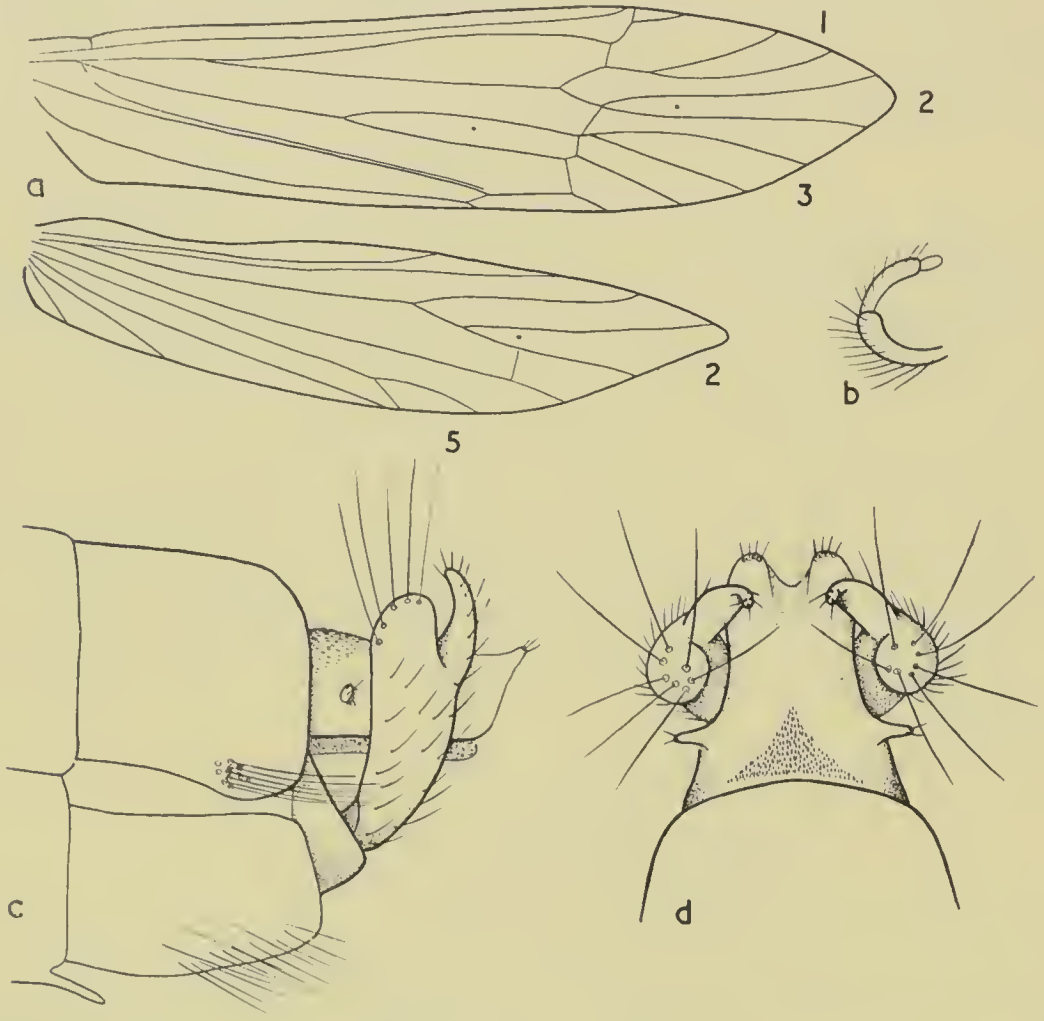

Fig. 32.—*Antipodoecia turneri* Mosely. ♂. *a*, wings ; *b*, maxillary palp from side ; *c*, genitalia, lateral ; *d*, dorsal.

Australia : New South Wales, Ebor. 10, 12.i.1916, 4 ♂ (*type* and paratypes) ; Hornsby, 18.xii.1916, R. J. Tillyard.

Type, ♂, is a balsam preparation now in the British Museum (N.H.).

Tamasia Mosely.

Tamasia Mosely, 1936, *Proc. Zool. Soc. Lond.*, 1936 : 399–401.

Ocelli absent. *Maxillary palpi* of the male four-jointed ; joints irregular in shape and length, partly membranous, fourth joints terminating in strongly

chitinized spines. *Antennae* with a scent-organ at the base which may vary in pattern should there be more than one species in the genus ; basal joint large and rounded, with the upper apical margins somewhat produced ; second joint very small, constricted at the middle. Anterior *wings* in both sexes with forks nos. 1, 2, 3 and 5 ; fork no. 3 with a footstalk, other forks sessile ; discoidal cell and cellula thyridii closed. Posterior wings of male very irregular. The whole postcostal area is doubled back over the wing, the fold being filled with short, yellowish hairs and containing a longish pencil of hairs at the base. In the figure this area is shown unfolded. There appear to be no apical forks and only one crossvein. In the female the neuration of the posterior wing is normal ; forks nos. 1, 2 and 5 present. Other details in the specific description.

Type species.—*Tamasia variegata* Mosely, 1936.

In the original description of the genus the posterior wing was figured and described erroneously, the fold having been considered to lie in the costal instead of the postcostal area. Recent fresh material shows this statement to have been wrong.

Tamasia variegata Mosely (figs. 33–35).

Tamasia variegata Mosely, 1936, *Proc. Zool. Soc. Lond.*, 1936 : 401, figs. 11–15.

♂. *Head* dark fuscous, with yellowish hairs and a narrow, keel-like ridge between the bases of the antennae. Oculi reddish. Basal joint of the *antenna* large, fuscous, thickly clothed with yellowish hairs ; remaining joints chocolate, with conspicuous pale annulations. Arising from the base of each antenna is a finger-like process very thickly clothed with hairs, probably a scent-organ. There are four tufts of hairs, one pair large, the other small, situated on the frons. Each joint of *maxillary palpi* of the male strongly chitinized on its lower surface but membranous on the upper. Terminal joint on the one side terminating in a pair of strongly chitinized spines, on the other, a single spine. The palpi are light fuscous, thickly clothed with yellowish hairs. *Legs* light fuscous. *Wings*, anterior, dark fuscous with conspicuous golden blotches and irrorations ; posterior, fuscous, with a large fold as detailed in the generic description. Other characters are given in the generic description.

Genitalia, ♂.—Apical margin of the eighth tergite bearing two patches of hairs, perhaps slightly raised warts, similar patches on preceding tergites, gradually diminishing in area. Margin of the ninth tergite produced in a complicated plate, the centre of which forms a bifurcate process, the apex of each fork turned sharply outwards at right angles to make triangular plates terminating in acute spurs. On each side of this central process is a slightly-curved, finger-like process, possibly a superior appendage, which, seen from the side, is produced at its lower basal margin in a rounded extension ; from above, on the outer side of each superior appendage is a short triangular projection with a rounded apex. Lateral margins of the ninth segment are produced towards their centres in blunt, triangular side-pieces. Penis short, arching downward, with five or six spines at the apex on the underside directed basalwards. There is a lower penis-cover consisting of a wide, membranous trough, apex bulbous,

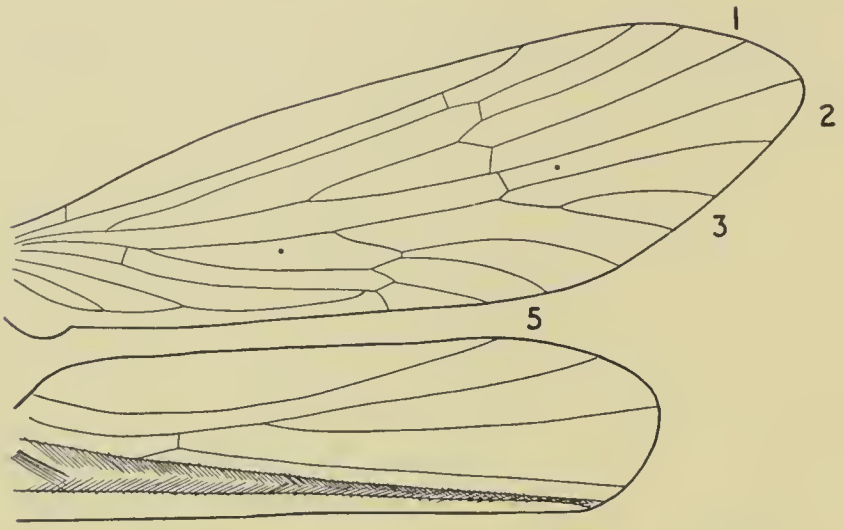

FIG. 33.—*Tamasia variegata* Mosely. ♂. Wings.

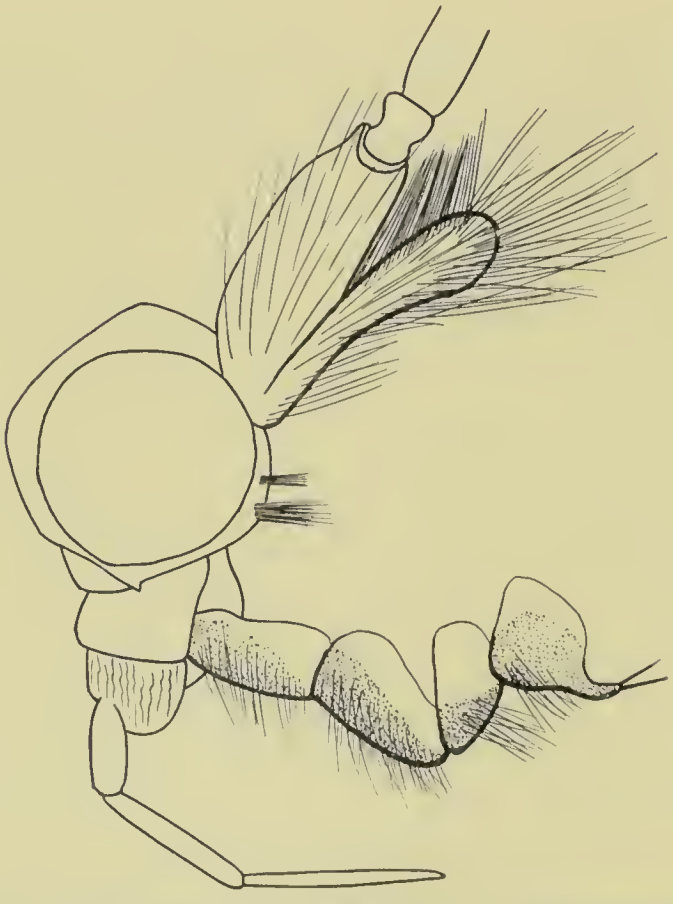

FIG. 34.—*Tamasia variegata* Mosely. ♂. Head from side.

excised, and directed upwards. Inferior appendages from beneath, very broad, apices truncate, with the outer angles produced and turned over along the apical margin, leaving narrow excisions. From the side there is an elevated, longitudinal ridge giving a false effect of a branch. The lower surface of the

Fig. 35.—*Tamasia variegata* Mosely. ♂. *a*, genitalia, lateral; *b*, dorsal; *c*, ventral.

appendage carries a mat of coarse hairs. Margin of the ninth sternite with a rounded excision at its centre; no ventral process.

Length of the anterior wing, ♂, 7 mm.

Tasmania: Miena, Great Lake, xii.1930, 1 ♂ (*type*), C. Parker.

Australia: New South Wales, Bathurst, 2300 ft., 10.ii.1884 (McLachlan Collection).

Tamasia sp., ♀ (fig. 36).

In the Tillyard Collection are one or two females (collected in fluid) evidently belonging to this genus, and no doubt the female of *variegata*, as yet the only described species. The posterior wing of the ♂ is very aberrant but

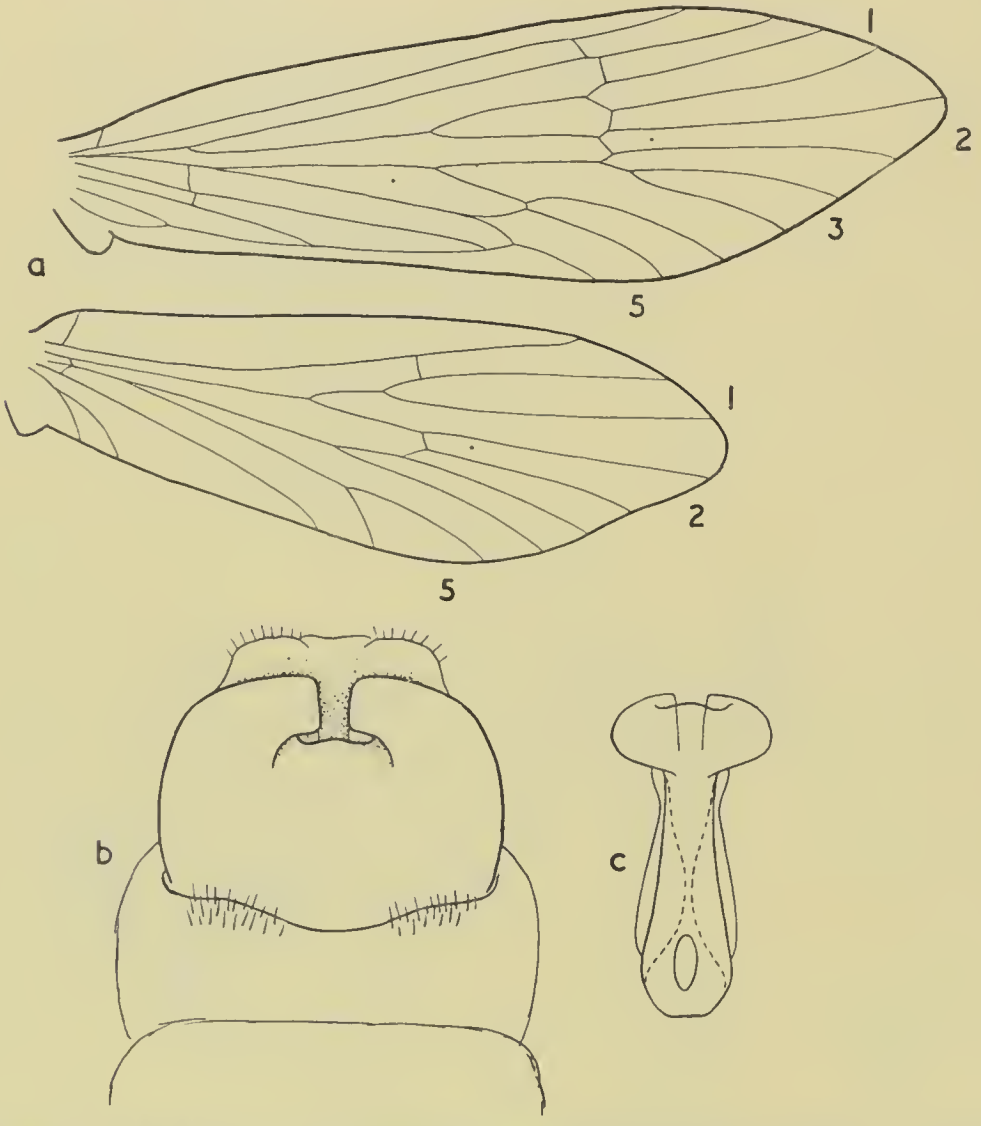

Fig. 36.—*Tamasia* sp. ♀. *a*, wings ; *b*, apex of abdomen, ventral ; *c*, vaginal structure, ventral.

the anterior is normal, and the neuration is practically the same in the two sexes.

Genitalia, ♀.—From beneath the penultimate segment terminates in a pair of broad, inturned, rather transparent lobes ; the vaginal structures are as shown in the figure.

Length of the anterior wing, 8·5 mm.

Tasmania : Scottsdale, 2.xi.1927, R. J. Tillyard.

Caenota gen. n.

♂. *Anterior wing* with normal neuration. Forks nos. 1, 2, 3 and 5 present. Posterior with a narrow, rolled fold of the anal margin filled with small reddish scales and there is possibly a second but shorter fold above it at the base. Both wings clothed with hairs and scales.

Antennae with the basal joint abnormal. There is an enormous protuberance at the back, lined with androconia and specialized hairs, and a small membranous or partly membranous branch in front. Second joint very short, constricted round the middle ; third nearly as long as the first. *Maxillary palpi* membranous, clothed with long hairs or scales, or both, 3-jointed ; third joint minute, structure obscure. *Spurs* 2, 2, 4.

Type species.—*Caenota plicata* sp. n.

The unusual form of the ♂ antenna and the rolled posterior margin of the hind wing readily separate *Caenota* from its allies.

Key to Species of *Caenota*, Males.

1. Abdomen with a dorsal crest of long, silky hairs ; lower penis-cover widely separated from the upper . . . . . *C. simulans* sp. n. (p. 62).
–. Abdomen without dorsal crest of long, silky hairs ; lower penis-cover welded to upper for most of its length . . . . . *C. plicata* sp. n. (p. 61).

Caenota plicata sp. n. (fig. 37).

The single specimen of this insect was collected in fluid and is very soft and almost completely denuded. *Antennae* with a large, circular, flattened lobe at the back of the basal joint and a small membranous branch in front. The basal joint is about as long as the depth of the head, second joint very short. constricted towards the middle, third joint nearly as long as the first, remaining joints rather longer than the second. *Maxillary palpi* membranous, densely covered with long hairs ; terminal joint small, the whole very irregular in shape when cleared in potash. *Anterior wings* thickly clothed with brownish hairs and numerous small, black scales along the nervures from the discoidal cell towards the base ; posterior wing with a groove along the subcosta as far as the first apical cell, and a fold along the anal margin, which is rolled over to contain a mass of small, reddish scales. There may be a second fold at the base of the wing, but its shape in this poor specimen is obscure. Anterior *legs* very heavily fringed, median legs normal ; both posterior legs wanting.

Genitalia, ♂.—From above, distal margin of the ninth segment withdrawn within the eighth. Superior appendages rather small and slender, finger-like and situated rather far from each other, inclining slightly inwards. Upper penis-cover from above, large, tapering slightly at the excised apex ; lateral margins produced in extended shelves. The cover, which from the side is very deep, with a notch on its lower surface near the apex, obscures the penis, which is short and arched. Lower penis-cover closely affixed to the penis, and from beneath, it appears as a pair of elongate lobes. Inferior appendages broad at the base, branched. From the side, upper branch long, narrow and

plate-like, heavily fringed ; lower branch, from beneath, forms a corkscrew-like spine with the apex directed outwardly and distally ; no ventral process.

Length of the anterior wing, ♂, 12 mm.

AUSTRALIA : Digger's Creek, 29–30.i.1930, R. J. Tillyard, 1 ♂, *type*, mounted in balsam.

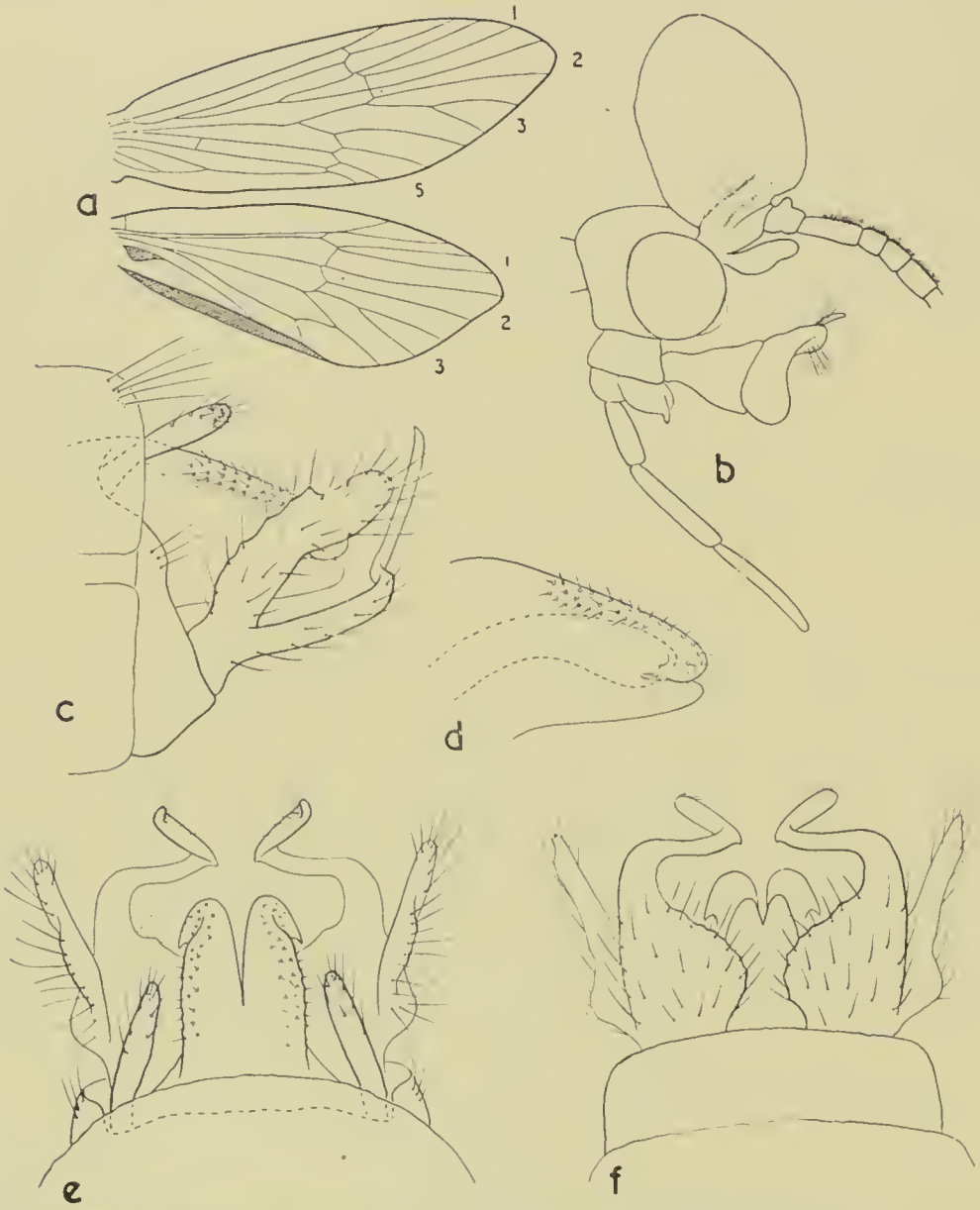

FIG. 37.—*Caenota plicata* gen. sp. n. ♂. *a*, wings ; *b*, head, lateral ; *c*, genitalia, lateral ; *d*, upper and lower penis-covers and penis (dotted), lateral ; *e*, genitalia, dorsal ; *f*, ventral.

Caenota simulans sp. n. (figs. 38, 39).

Insect yellowish. *Head* clothed with a dense mass of silky, yellow hairs, mixed with scales. When denuded, a large, rounded process is seen at the

back of the first joint of each antenna ; in front of the joint there is a complex branch formed by a sleeve, pigmented at the sides and carrying a small, circular branch. Basal joint rather less than the width of the head between the oculi ; next joint very short, constricted in the middle ; third joint slightly shorter

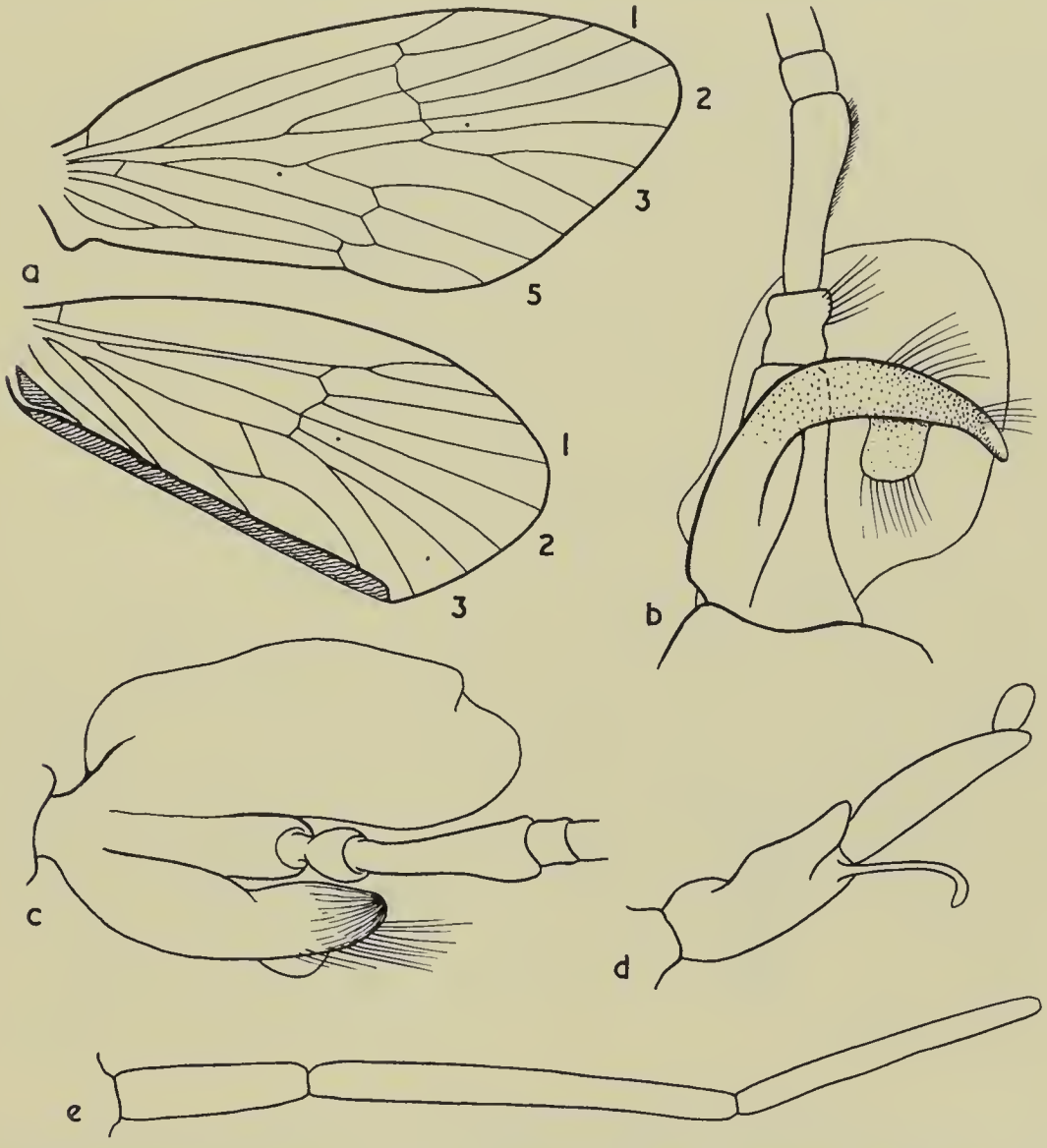

Fig. 38.—*Caenota simulans* sp. n. ♂. *a*, wings ; *b*, base of antenna from front ; *c*, base of antenna from side ; *d*, maxillary palp from above ; *e*, labial palp.

than the first and bearing a line of scales ; remaining joints rather longer than the second. *Maxillary palpi* obscure, probably three-jointed, a hooked process arising from the apex of the basal joint. Both sets of palpi densely clothed with silky, yellow hairs. *Wings* fuscous, with numerous golden-yellow irrorations ; two considerable yellow areas in the postcostal region towards the base. Many of the nervures are lined with scales, particularly in the anal

region. In the posterior wing there is a shallow groove in the region of the snbcosta, but not sufficiently pronounced to be defined in the figure. The posterior margin is folded over to enclose a dense mass of silky yellow hairs ; neuration as figured.

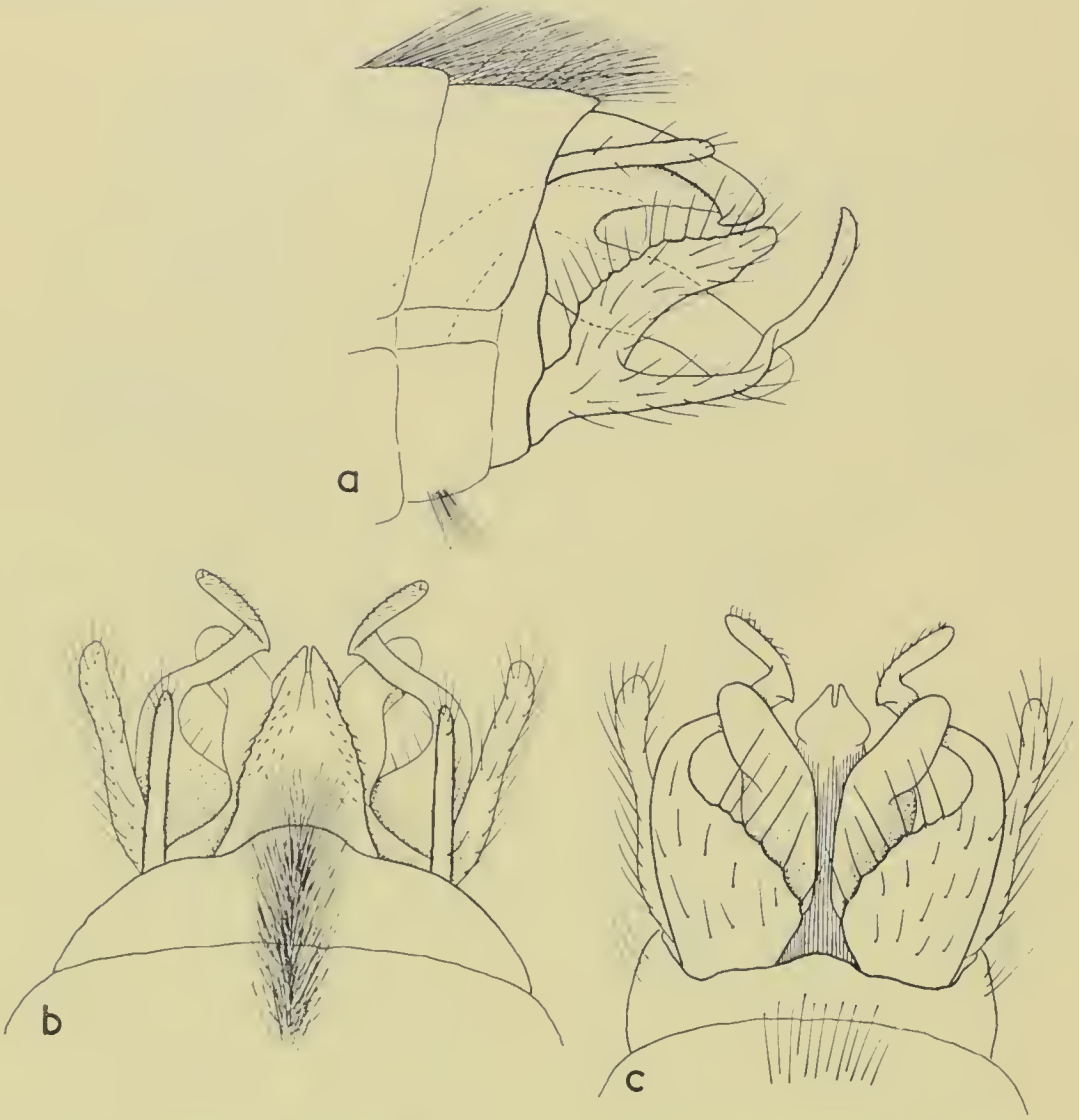

Fig. 39.—*Caenota simulans* sp. n. ♂. Genitalia, *a*, lateral ; *b*, dorsal ; *c*, ventral.

On the *abdomen* there is a dense crest of yellow hairs extending back to the fourth tergite along the centre.

Genitalia, ♂.—Excepting in the form of the lower and upper penis-covers, there are no appreciable differences in the pattern of the varions parts between *simulans* and *plicata* that can be conveyed in a written description. With regard to the lower penis-cover, the lobes in *plicata* appear firmly adpressed to the penis whilst in *simulans* they stand clearly separated ; they form

longish plates, set on edge, with their apices protruding between the inferior appendages.

Length of the anterior wing, ♂, 14 mm.

AUSTRALIA : Queensland, National Park, 3000 ft., 2.i.1922, 1 ♂, Tillyard Collection.

Tismana gen. n.

Ocelli absent. Basal joint of the *antenna* about as long as the head ; second and third joints shorter than each of the remaining joints. *Maxillary palpi*, ♂, three-jointed ; joints rather swollen ; first and second about equal in length, third smaller. *Thorax* with a pair of yellow, lunate patches, one on each side of the centre. *Spurs* 2, 2, 4. *Anterior wing* with forks nos. 1, 2, 3 and 5 ; posterior, nos. 1, 2 and 5.

Type species.—*Tismana saneva* sp. n.

This genus may be separated from *Helicopsyche* Hagen by its three-jointed maxillary palpi and the different neuration of the posterior wing.

Tismana saneva sp. n. (figs. 40, 41).

Insect light brownish. Other characters included in the generic description.

Genitalia, ♂.—Distal margin of the ninth dorsal segment deeply excised from the strongly produced side-pieces. Superior appendages widely separated, long, bases slightly constricted. Upper penis-cover in the form of a stout bifurcate process, lying closely over the penis, with very long, stout spines arising from the lateral margins near the apex and directed outward and basally, two on one fork and three on the other. Penis arching downward, arising from a sleeve with cup-shaped rim. Inferior appendages long and stout, extending as far as the apices of the superior appendages, apices slightly bent inwards. From beneath the inner margins are widely excised towards their apices. Distal margin of the ninth ventral segment truncate ; the segment is deeply pigmented and there is a clear space in the pigmentation at the centre simulating an excision, no ventral process.

Length of the anterior wing, ♂, 7 mm.

TASMANIA : J. W. Evans, 1 ♂ (*type*), Hobart, x.1936, J. W. Evans, 2 ♂.

Type mounted in balsam.

Helicopsyche Hagen.

Helicopsyche Hagen, 1866, *Ent. Mon. Mag.*, **2** : 252.
Helicopsyche McLachlan, 1880, *Rev. Syn. Trich. Suppl.*, pt. **2** : lviii.
Helicopsyche Hutton, 1899, *Trans. N. Zeal. Inst.*, **31** : 239.
Helicopsyche Tillyard, 1924, *Trans. N. Zeal. Inst.*, **55** : 312.

Spurs 2, 2, 4, ♂, ♀, long and strong, but the external spur on anterior tibiae is rudimentary ; sub-apical pair on the posterior tibiae not far above the apical. *Antennae* stout, about the length of the wings, the basal joint long and strong, gradually dilated at the apex, very hairy, curved backward over the top of the head so that the entire antenna in the dried insect is directed

backward. *Head* transverse; above are two enormous pyriform, slightly curved, densely hairy warts, almost touching posteriorly. These warts are raised much above the disc of the head, which has a deep, longitudinal, median, impressed line. On the front, anteriorly, inside the base of the antennae (in the male only), are two large, valve-like protuberances, somewhat flattened laterally and concave internally. *Ocelli* absent. *Maxillary palpi* of the ♂ ascendant, two-jointed; of the ♀, with the basal segment long, succeeding joints shorter. *Anterior wings* elongate-oval, obtuse, very densely pubescent, and with long and strong apical fringes. Apical forks nos. 1, 2, 3 and 5 present.

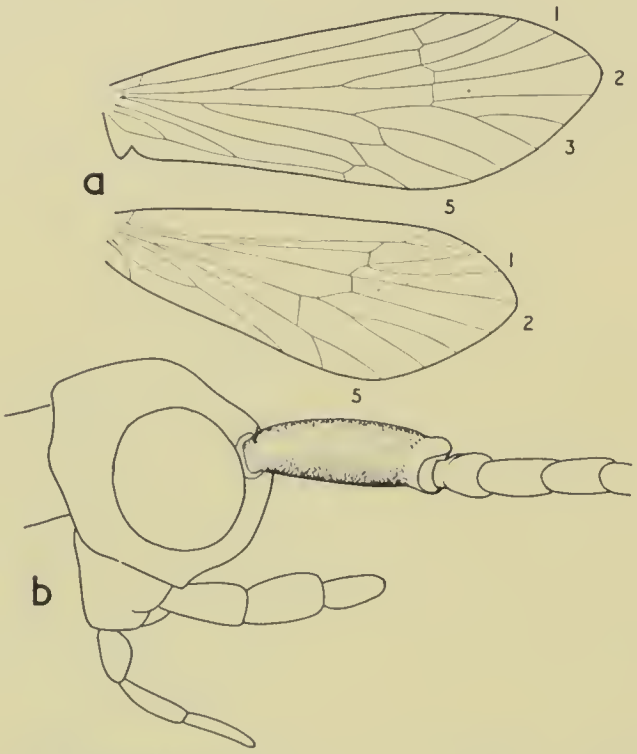

Fig. 40.—*Tismana saneva* gen. sp. n. ♂. *a*, wings; *b*, head, lateral.

Sub-costa and radius parallel and simple; discoidal cell long; cellula thyridii very long, broad. Post-costa with a simple fork at its base. Posterior wings considerably shorter, sub-acute, also densely pubescent, with very long fringes; a row of hooks along the costa to about midway. Sub-costa and radius simple and parallel; discoidal cell wanting; sector forming a very long fork, the upper branch of which shows a small apical fork no. 1, the only other apical forks being nos. 3 and 5. Fork no. 3 is absent in the type species, in *H. heacota* sp. n., and possibly in other species also. The larvae inhabit heliciform cases.

Type species.—*Notidobia borealis* Hagen, 1861.

The above account of the genus is more or less that given by McLachlan, apart from the numbering of the forks (see below). Tillyard does not agree with McLachlan and Hagen that fork no. 4 is present in the posterior wing, holding that what appears to be the fork is the result of various diversions of

the main nervures, and is in fact a false fork. He holds, therefore, that *Helicopsyche* presents no departure from the general rule that fork no. 4 is invariably absent in the posterior wings in Trichoptera.

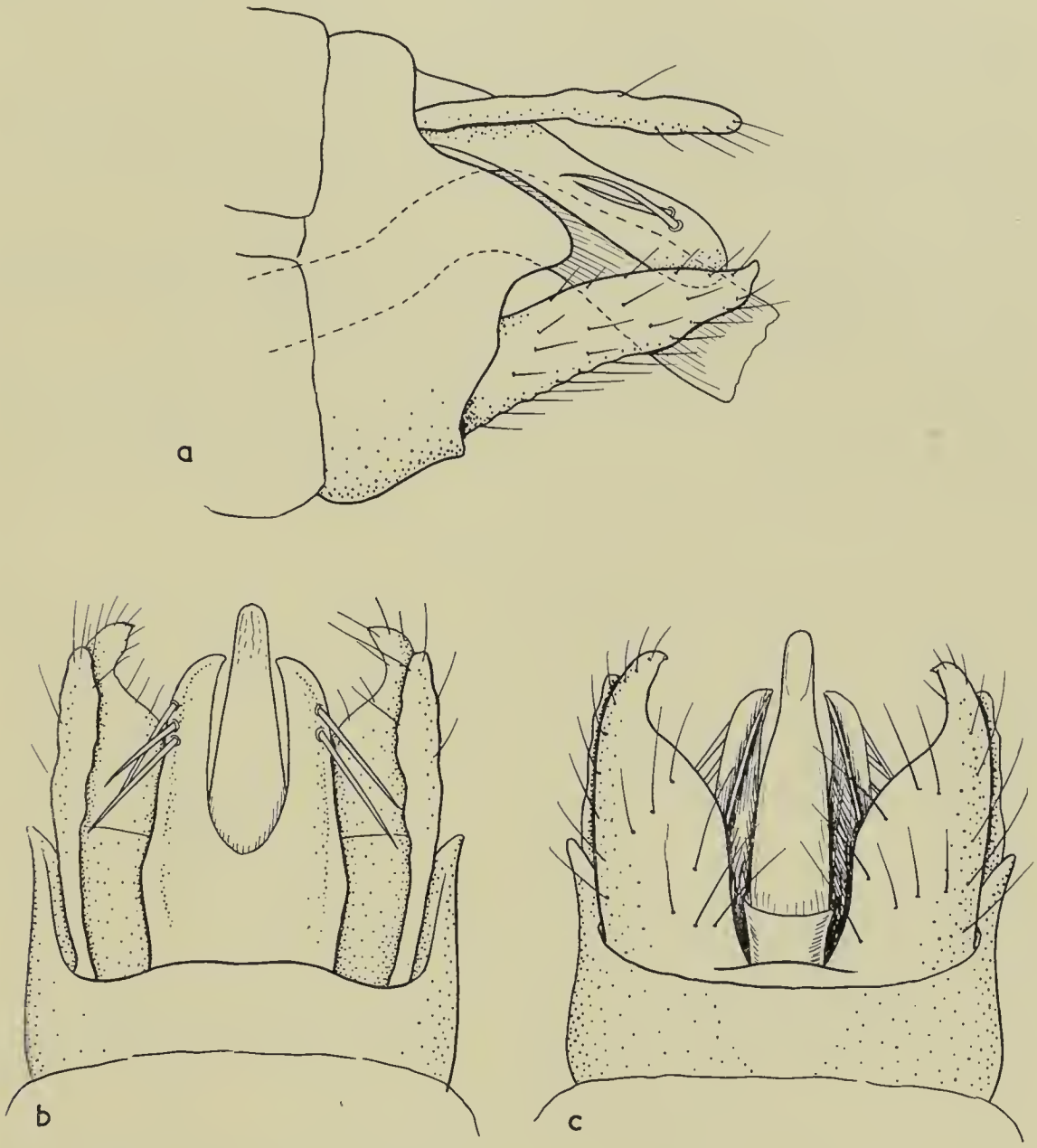

FIG. 41.—*Tismana saneva* sp. n. ♂. *a*, genitalia, lateral ; *b*, dorsal ; *c*, ventral.

[Some diversity of opinion exists as to the numbering of the apical forks in this genus. It seems generally agreed that forks nos. 1 and 5 are present in both wings. McLachlan numbers the forks of the anterior wing of the type species 1, 4 and 5 and the posterior wing 1 and 5. Ulmer follows McLachlan

in the case of the type species, and gives the forks as 1, 4 and 5 in the posterior wing of *H. revelieri*, the European species. Tillyard, dealing with the New Zealand forms, writes of the fore wing—

"M_2 and M_3 are fused for some distance basally, thus forming an apparent apical fork between them when they diverge distally."

He thus implies that the forks are 1, 3, 4 and 5. Of the hind wing he writes :

"The same fusion takes place between M_2 and M_{3+4} basally, and results in the apparent presence of three veins, M_{1+2}, M_3 and M_4, though these are actually M_1, M_2 and M_{3+4}."

The forks in the hind wing are thus 1, 3 and 5. Betten, however, considers that the vein interpreted by Tillyard as M_1 in the anterior wing is really R_5, and gives the apical forks as 1, 2 and 5. He describes the media as three-branched, and therefore there must be either fork no. 3 or 4.

In this work I have adopted a modification of Betten for the fore wing (forks nos. 1, 2, 3 and 5) and have accepted Tillyard's interpretation of the hind wing (forks nos. 1 and 5 or 1, 3 and 5, according to species). My interpretation of the veins concerned is marked on the figures of *H. murrumba* and *H. heacota*.—D. E. K.]

Key to Species of *Helicopsyche*, Males.

1. Posterior wing with forks nos. 1 and 5 only . . . *H. heacota* sp. n. (p. 68).
–. Posterior wing with forks nos. 1, 3 and 5 . . . . . 2.
2. Posterior wing with either a hair-filled fold or a pencil of hairs in posterior half . . . . . 3.
–. Posterior wing without either fold or pencil of hairs . . . . . 4.
3. Posterior wing with a long fold filled with hairs along the posterior margin from base to anastomosis (Tasmania) . . . . *H. bartona* sp. n. (p. 71).
–. Posterior wing with a pencil of hairs arising from anal lobe (New South Wales) *H. tillyardi* sp. n. (p. 71).
4. Anterior wing with a fold along the post-costa towards the base (Australia) *H. murrumba* sp. n. (p. 72).
–. Anterior wing without fold along the post-costa (New Zealand) . . . 5.
5. Dorsal plate rather broad, with a deep narrow excision at apex *H. iltona* sp. n. (p. 74).
–. Dorsal plate slender, with a shallow V-shaped excision at apex *H. albescens* Tillyard (p. 75).

Not included owing to insufficient diagnosis : *H. howesi* Tillyard, *H. zealandica* Hudson.

Helicopsyche heacota sp. n. (fig. 42).

Insect dark ; *wings* dark brown ; posterior wing with the apex rather more acute than in the other described species and with the posterior margin excised before the apex ; apical forks nos. 1 and 5 only present.

Genitalia, ♂.—From above, margin of the ninth dorsal segment produced in a long parallel-sided upper penis-cover, the distal margin triangular and slightly cleft. Superior appendages small and rounded. Penis furnished on its upper surface at apex with a pair of peg-like spurs arising from chitinous

rings. Inferior appendages trifurcate, the main stems calliper-shaped, one branch arising almost at right angles from the upper margin towards the base,

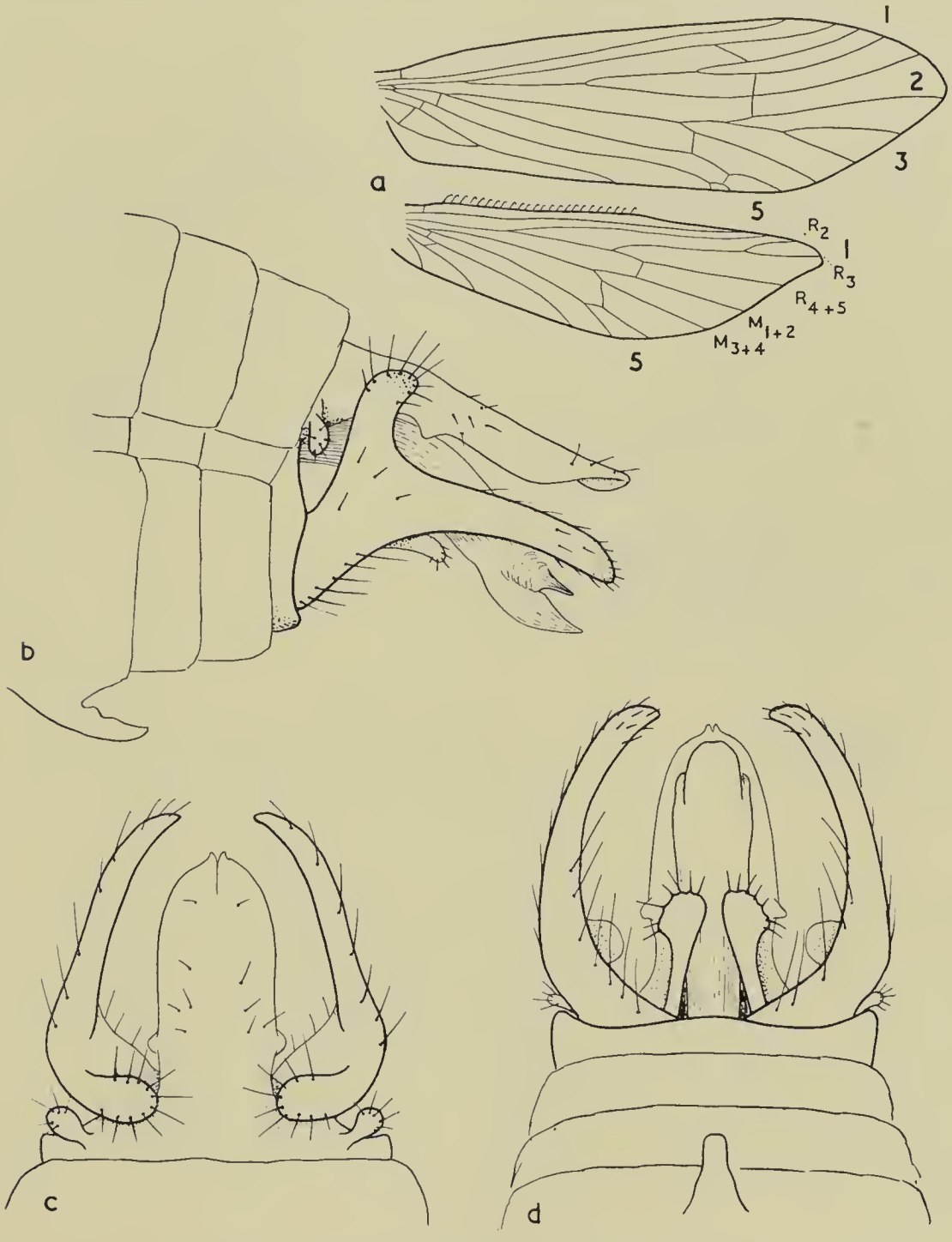

Fig. 42.—*Helicopsyche heacota* sp. n. ♂. *a*, wings ; *b*, genitalia, lateral ; *c*, dorsal ; *d*, ventral.

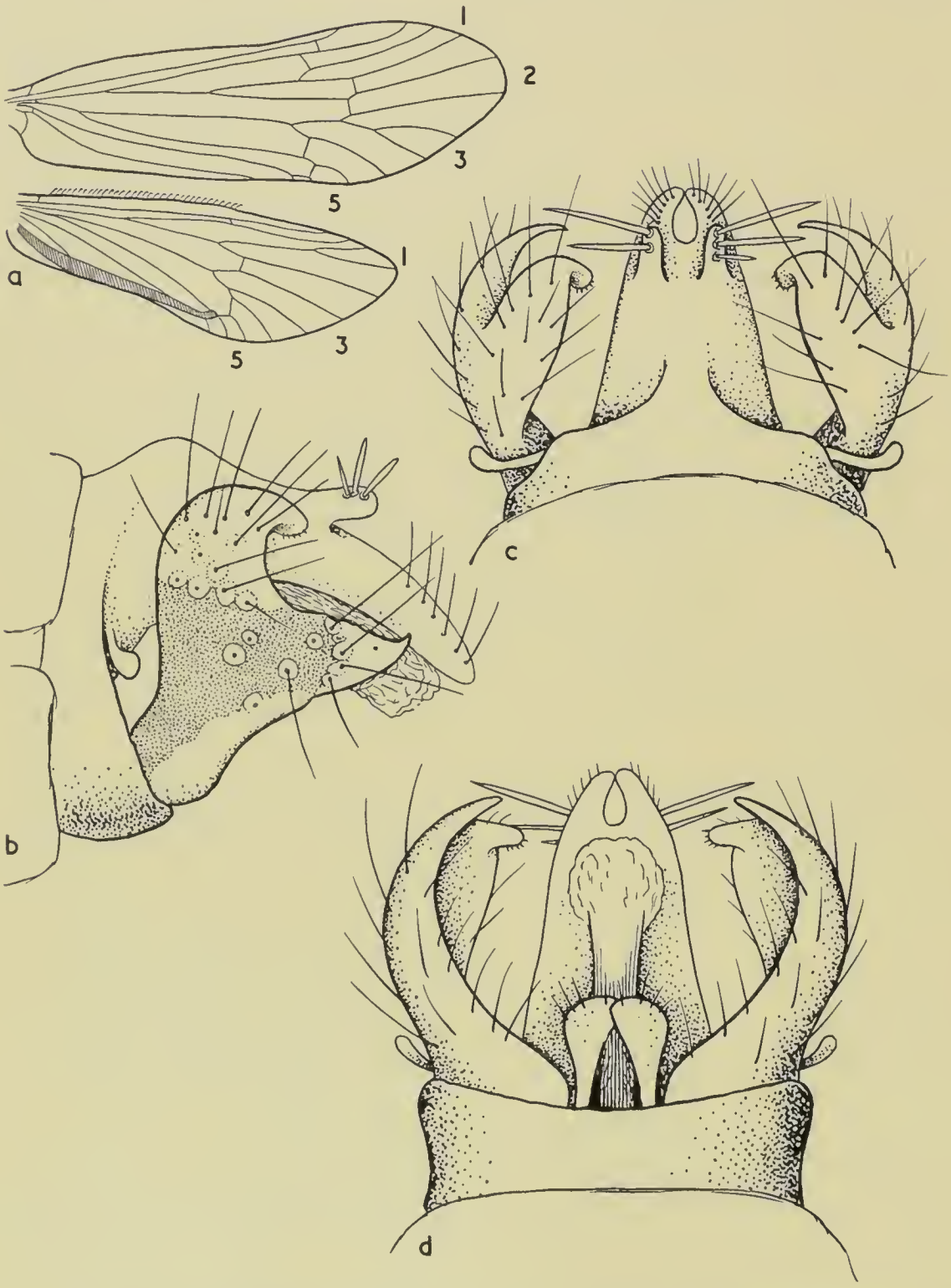

FIG. 43.—*Helicopsyche bartona* sp. n. ♂. *a*, wings; *b*, genitalia, lateral; *c*, dorsal; *d*, ventral.

the usual club-shaped branch arising at the base of the segment. A strong process to the sixth sternite.

Length of the anterior wing, ♂, 5 mm.

AUSTRALIA : New South Wales, Heathcote, 17.iii.1917, 2 ♂, R. J. Tillyard.

Type with abdomen mounted in balsam.

H. heacota is separable from other specimens in this region by the absence of fork no. 3 in the posterior wing.

Helicopsyche bartona sp. n. (fig. 43).

Insect dark, with dark wings. In the anterior *wing* the neuration is normal ; in the posterior there is a fold filled with yellow hairs, extending from the base of the wing along the anal border as far as the anastomosis ; forks nos. 1, 3 and 5 present.

Genitalia, ♂.—From above, distal margin of the ninth segment produced to form a large upper penis-cover, towards the apex of which arises a pair of processes, each with two or three strong and long spines directed outward ; beyond these is a double row of bristles along the centre, extending to the apex, which is cleft to make a pair of fingers with apices nearly touching. Superior appendages small and narrow, directed outward. Penis slightly arched, with dilated apex. Inferior appendage trifurcate ; from the side it is stout, divided to about midway into two lobes or branches with inturned apices, the lower branch narrowing to a pointed apex, the upper stout and blunt. From beneath, a small, clubbed branch can be seen, arising at the base towards the centre of the segment.

Length of the anterior wing, ♂, 5 mm.

TASMANIA : Hobart, xii.1937, 1 ♂, J. W. Evans.

Type with abdomen mounted in balsam.

The reticulation, generally confined to one or two sternites, extends in *bartona* to every segment except the first and second.

Helicopsyche tillyardi sp. n. (fig. 44).

The insect (collected in fluid) appears to be generally brownish. It differs from other species in the genus in having a long, dark pencil of hairs at the base of the posterior wing ; apical forks nos. 1, 3 and 5 present.

Genitalia, ♂.—Apical margin of the ninth tergite strongly produced in an elongate plate, terminating in a bifurcate process, whose upper surfaces are furnished with a few stout, basally directed spines, the margins also bearing, at their bases, sparse hairs or spines. At the base of the plate, on each side, is a small process directed downwards. Penis arching downward. Inferior appendage very large ; from the side the base is very broad, upper margin swollen into a large, distally directed hook, apex produced and incurving. Seen from beneath, between the appendages is a pair of slender, parallel processes, perhaps branches of the appendages ; apices bearing some downwardly directed spines. A strong process to the sixth sternite ; all the sternites bearing a reticulated pattern.

Length of the anterior wing, ♂, 4·5 mm.

AUSTRALIA: New South Wales, Rules Point, 4450 ft., 30.xii.1934, 1 ♂, R. J. Tillyard.

This species is distinguished from *H. bartona* by the presence of a pencil of hairs, but no fold in the posterior wing.

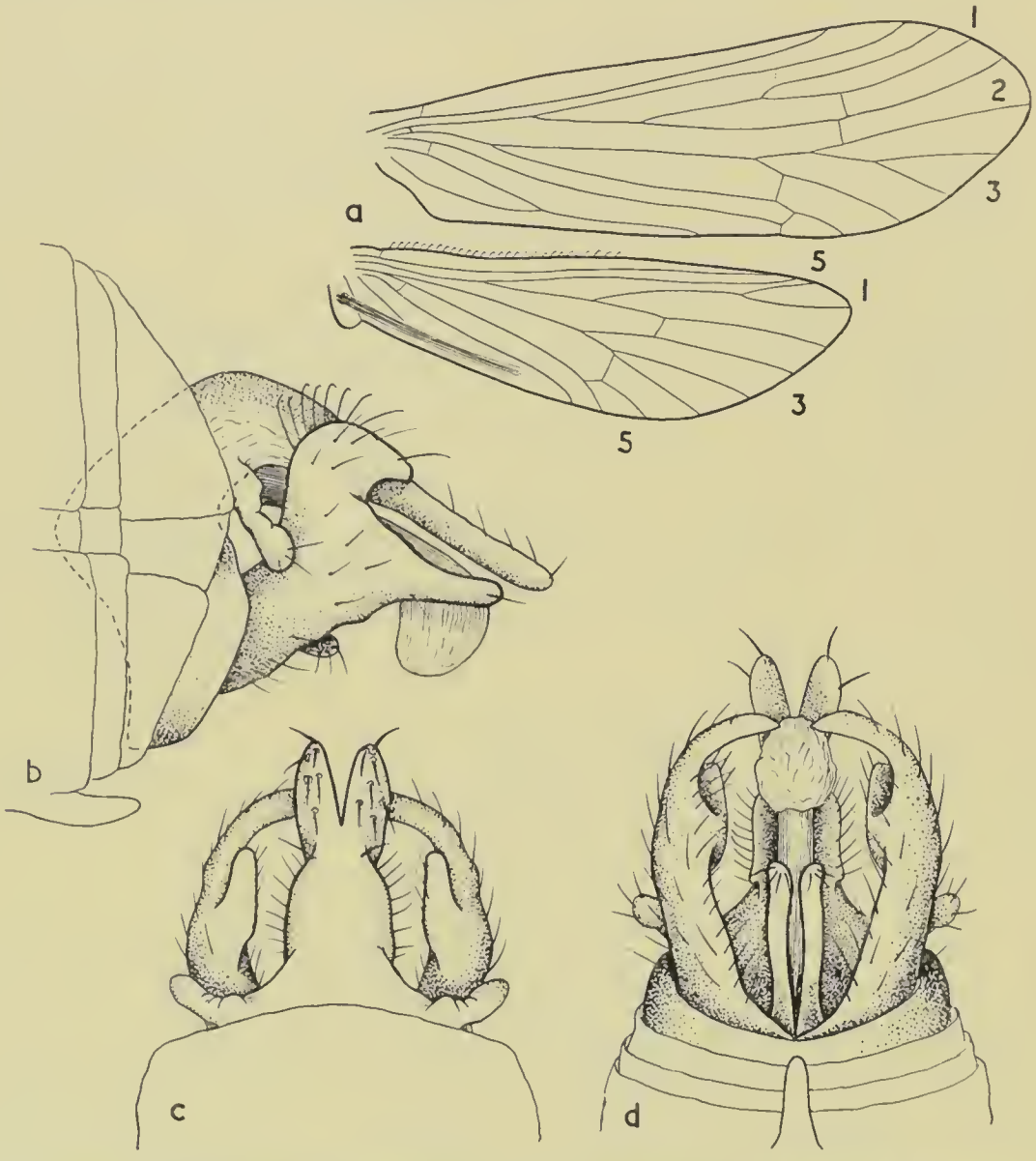

FIG. 44.—*Helicopsyche tillyardi* sp. n. ♂. *a*, wings; *b*, genitalia, lateral; *c*, dorsal; *d*, ventral.

Helicopsyche murrumba sp. n. (fig. 45).

Insect dark brown. *Maxillary palpi* with the terminal joint a little more than half the length of the basal, which bears at its base a group of particularly broad androconia. *Anterior wing*, ♂, differing from other described species

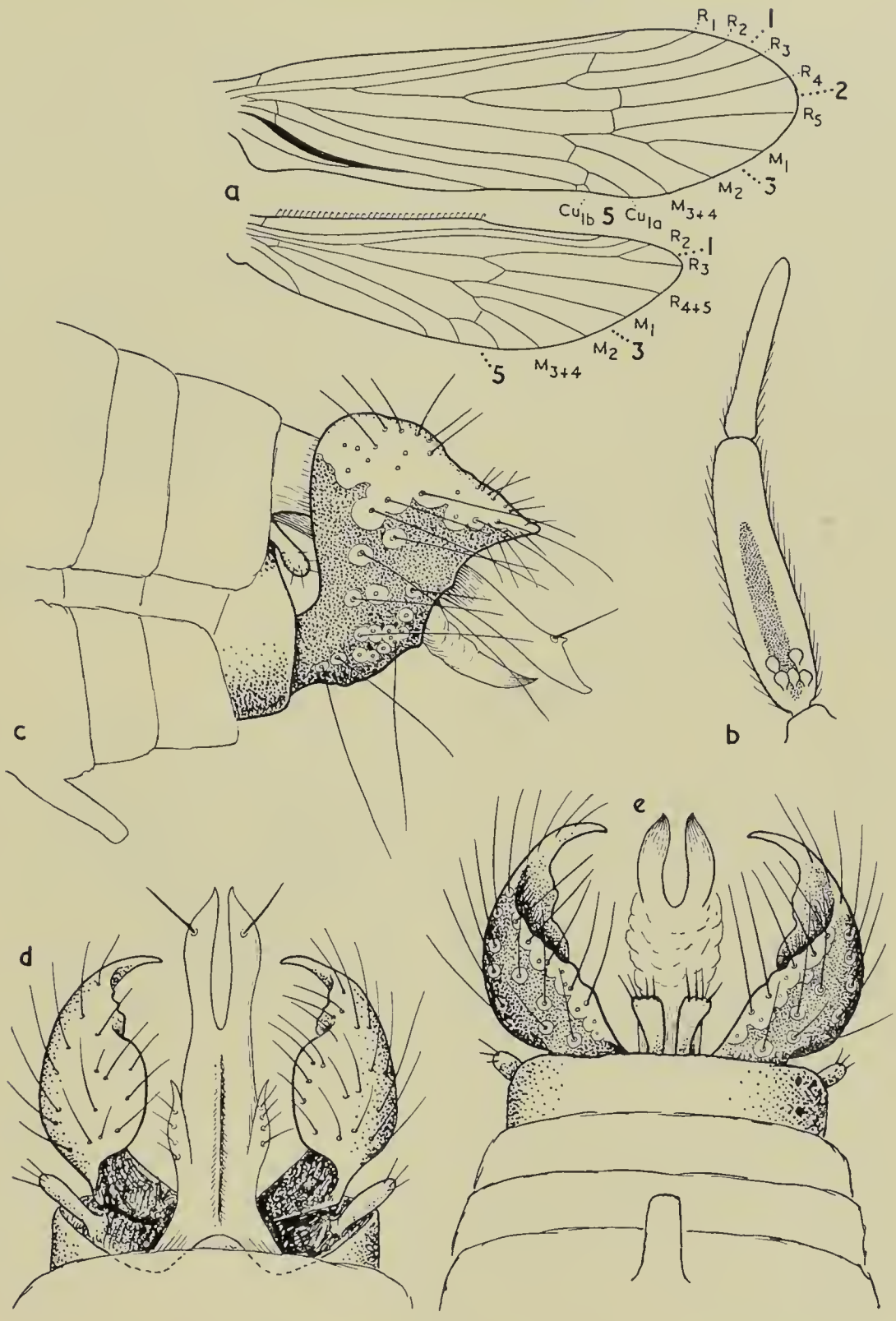

FIG. 45.—*Helicopsyche murrumba* sp. n. ♂. *a*, wings ; *b*, maxillary palp ; *c*, genitalia, lateral ; *d*, dorsal ; *e*, ventral.

in having a conspicuous fold along the post-costa towards the base. Posterior wing with forks nos. 1, 3 and 5.

Genitalia, ♂.—Integument of all the sternites excepting the second strongly reticulated. From above, distal margin of the ninth segment produced in a triangle which is the base of the upper penis-cover ; this is very long, parallel-sided, and deeply cleft near the apex, towards which it bears a pair of bristles ; at the base there may be, on each side, a closely adpressed, narrow, distally directed process, but these are very obscure. Superior appendages small and elongate. Penis long ; apex divided in a pair of forks with apices nearly touching and with strongly convex margins. Inferior appendages with a narrow base, from which there arises a large, swollen mass, which is humped on its upper margin and absorbs the upper fork usual in the genus. From above, the lower angle of the apical part appears as an inturned claw ; the sides of the appendage are patterned with rounded irrorations ; the usual, clubbed, ventral branches are present. A strong, blunt process to the sixth sternite ; there is also a minute process to the second sternite, a feature so far as I know, unique in the Trichoptera.

Length of the anterior wing, ♂, 5 mm.

Australia : F. C. T., R. Murrumbidgee, i.1933, 1 ♂, R. J. Tillyard ; New South Wales : Mt. Kosciusko, 2700 ft., 20.i.1889, 3 ♂, McLachlan Collection (*Type* ♂ with abdomen mounted in balsam.)

Helicopsyche iltona sp. n. (fig. 46)

Insect black ; *antennae* black with yellowish brown annulations. *Legs* brown with whitish patches at the bases of the tarsal joints. *Wings* black : anterior with two very faint, pale patches caused by the presence of a few, rather widely-scattered, golden hairs towards the centre of the wing and also at its apex. The neuration resembles that of *H. borealis* Hagen, but the posterior wing differs slightly from this species, as figured by Ulmer in the *Genera Insectorum*, in the presence of apical fork no. 3.

Genitalia, ♂.—Ninth segment triangular, apex produced in a large, furcate dorsal plate sloping slightly downward, each fork rectangular, with a narrow excision between ; about midway are four finger-like processes, each armed with a single bristle. There are one or two smaller processes arising on the upper surface of the plate, each also with a single bristle ; at the base of the plate may be seen the superior appendages, with clavate apices. Penis short and membranous, with a pair of divergent sheaths, apices harpoon-shaped, one on each side. Inferior appendages with a large quadrate plate arising from the upper margin, bending over dorsally to cover the outer edges of the dorsal plate. The main stem of the appendage terminates in a pointed spur resembling the beak of a bird. There is a short ventral branch with a dilated apex armed with three bristles, the branches of the two appendages being parallel when seen from beneath ; no ventral process.

Length of the anterior wing, ♂, 5 mm.

New Zealand : Wellington, 1891, 8 ♂ ; Wilton's Bush, 9.ii.1929, 1 ♂,

x–xi.1934, 2 ♂, 20.xi.1936, 1 ♂, 6.xii.1937, 1 ♀; Gollan's Valley, 6.xii.1932, 1 ♂, all collected by G. V. Hudson; Karori, 30.xi, 6.xii.1919, 3 ♂, *ex* Tillyard Collection.

Type ♂, Wilton's Bush, x–xi.1934.

This species is closely related to *H. albescens* Tillyard, but may be distinguished by form of the dorsal plate in the male.

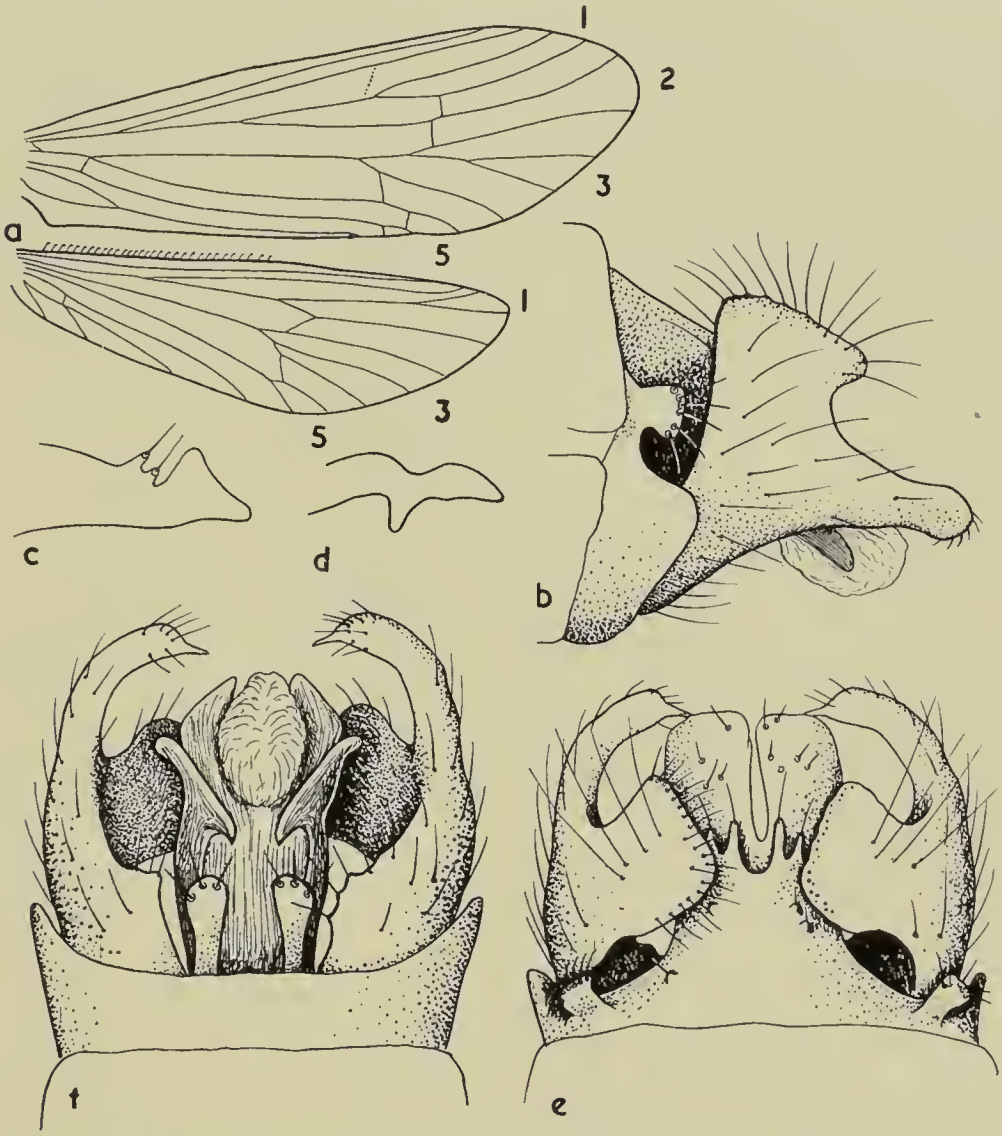

FIG. 46.—*Helicopsyche iltona* sp. n. ♂. *a*, wings; *b*, genitalia, lateral; *c*, dorsal plate, lateral; *d*, penis-sheath, lateral; *e*, genitalia, dorsal; *f*, ventral.

Helicopsyche albescens Tillyard (fig. 47).

Helicopsyche albescens Tillyard, 1924, *Trans. N. Zeal. Inst.*, **55**: 312–313, pl. 19, fig. 19; text-fig. 26.

Tillyard describes the species as follows:

" ♂. Total length, 3 mm.; forewing, 4·5 mm.; expanse, 9·5 mm.

"The whole of the *head*, *thorax* and *abdomen* dull brownish-testaceous, except eyes, which are blackish, and antennae, which are testaceous: legs pale greyish-testaceous.

"*Wings* semitransparent whitish, with very pale greyish hairs and fringe; venation pale-greyish. Appendages of very characteristic form, as may be seen from the figure; process of tenth tergite wider at base than at apex, and the latter

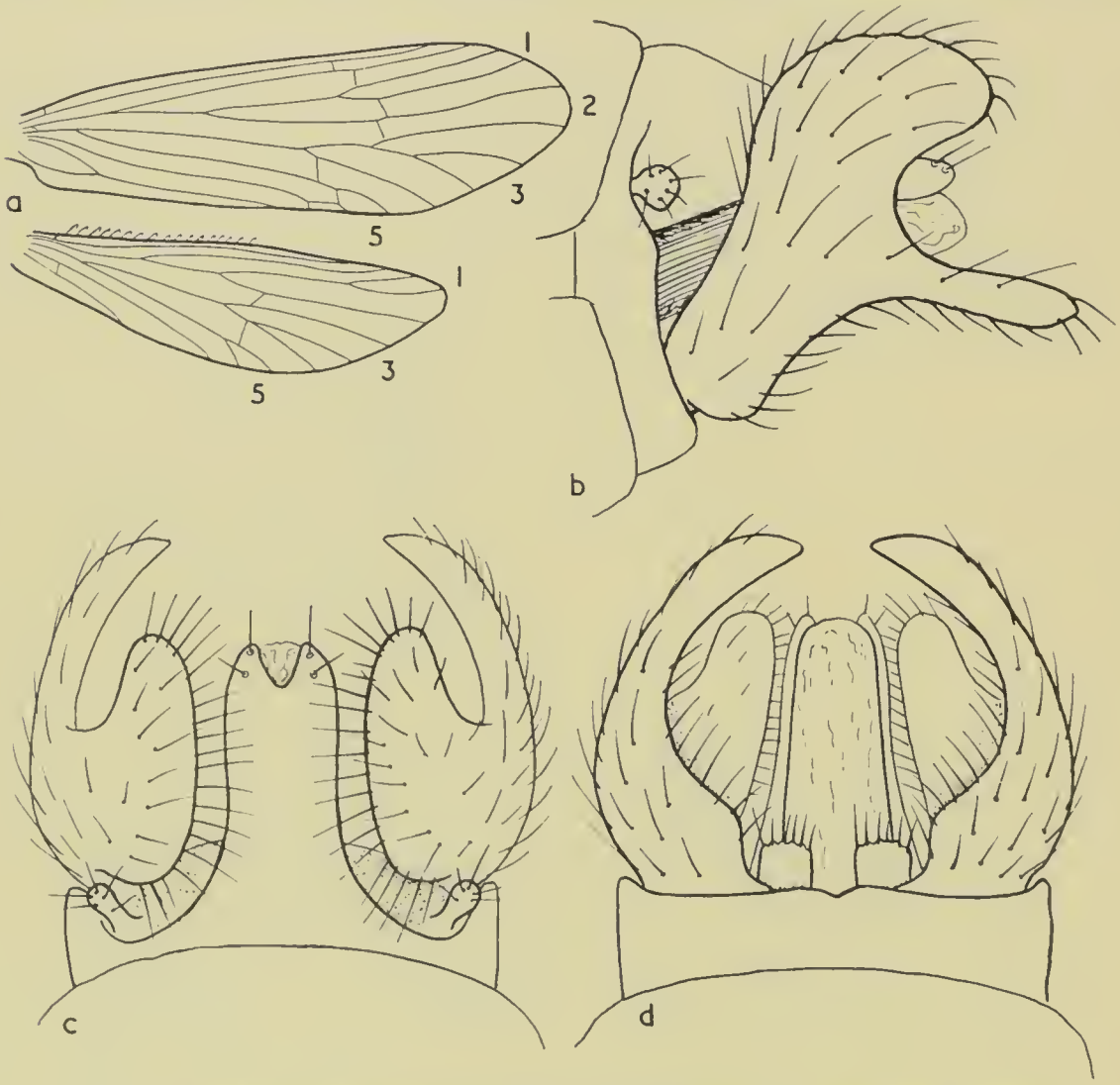

FIG. 47.—*Helicopsyche albescens* sp. n. ♂. *a*, wings; *b*, genitalia, lateral: *c*, dorsal; *d*, ventral.

triangularly incised and carries four short stiff bristles; pre-anals short and slender; gonapophyses very large, two-branched, and exceedingly hairy.

"*Types*, holotype male, allotype female and series of paratype males, N. Zealand, Purau Creek, Lyttleton Harbour (3 January, 1920, R.J.T.) in Cawthron Institute Collection."

Two of the male paratypes are now in the British Museum (N.H.) and from one of these I add a further description of the genitalia.

Genitalia, ♂.—From above, distal margin of the ninth segment produced in a long upper penis-cover, bifurcate at the apex. Superior appendages very small and rounded. Penis lying closely beneath the upper cover, sinuous from the side. Inferior appendages trifurcate, stout from the side, with the upper margin elevated in a humped fork narrowing towards the apex. The second fork is a slender production of the lower margin, seen from the side. From above, the lower branches of the appendages curve towards each other to make a pair of callipers. Third branch very small, clavate, seen from beneath to arise from the base of the appendage from the inner margin. The reticulation on the surface of the sternites is very faint.

Length of the anterior wing, ♂, 4 mm.

New Zealand : Purau, 3.i.1920, R. J. Tillyard.

This description has been made from a paratype bearing the label *H. albescens* in Tillyard's own handwriting, but I am unable to reconcile the

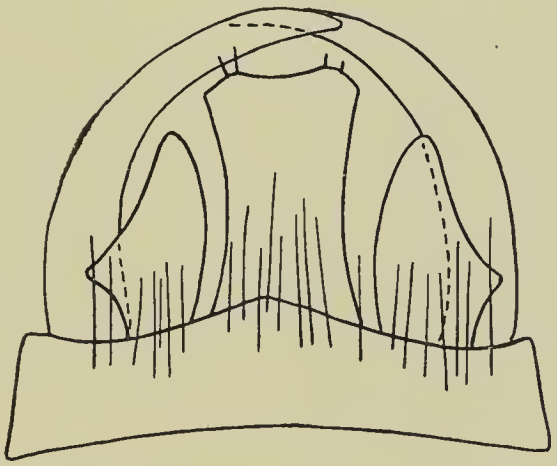

Fig. 48.—*Helicopsyche howesi* Tillyard. ♂. Genitalia, dorsal (after Tillyard).

genitalia entirely with Tillyard's figures. There is a further example from the Tillyard Collection, labelled Nelson, 1.i.21, A. Philpott.

Helicopsyche howesi Tillyard (fig. 48).

Helicopsyche howesi Tillyard, 1924, *Trans. N. Zeal. Inst.*, 55 : 313–314, pl. 19, fig. 20 ; text-fig. 27.

Tillyard describes the species as follows :

" ♂. Total length 3·5 mm. ; forewing 5·5 mm. ; expanse 11·5 mm.

" *Head*, *thorax* and *abdomen* dull brownish-testaceous ; antennae testaceous with basal segments darker, fuscous ; epicranium with long, fuscous hairs. Legs very pale testaceous.

" Wings pale-greyish, with slightly-indicated paler whitish patches on forewing at one-third from base, near costa, and at two-thirds from base, below pterostigma, also a little before pterostigma and distally between M and Cu_1. Hairs and fringe greyish, with slight tinge of brown. Appendages of dried insect as shown in the

figure ; the process of tenth tergite as broad at apex as at base, the tip strongly truncated : pre-anals short, subtriangular, angulated externally not far from bases ; gonapophyses much larger, appearing strongly forcipated when viewed from above.

" ♀ unknown.

" *Type*, holotype male, unique, Dunedin, New Zealand (1st January, 1920) in Cawthron Institute collection. The larvae were plentiful in the streams, and their cases are larger and composed of coarser sand-grains than those of the other two species. Mr. W. G. Howes has, I believe, succeeded in rearing this species several times."

I am unacquainted with this species.

Helicopsyche zealandica Hudson.

Helicopsyche zealandica Hudson, 1904, *New Zeal. Neur.* : 70, pl. 11, figs. 4–6.
Helicopsyche zealandica Hare, 1919, *Trans. N. Zeal. Inst.*, 42 : 31.

Hare describes the species as follows :

" Fuscous-brown. Antennae slightly shorter than forewings, clothed with pubescence ; 1st joint with longish hairs. Maxillary palpi stout, terminal joint curved, ascending ; densely hairy. Wings with dense clothing of hairs : forewings with costa and dorsum nearly parallel ; lower branch of sector and upper branch of superior cubitus closely approximated ; greyish, with light-fuscous hairs mixed with golden, somewhat darker on longitudinal veins ; termen and fringe mixed with black ; hind wings rather narrow, with light fuscous hairs ; dorsal fringe very long, greyish-fuscous. Legs light brownish-fuscous, posterior tibiae darker ; spurs 2, 4, 4, the inner longer than the other, and the median pair of posterior tibiae close to terminal pair ; tarsal joints pale-tipped.

" Length of body, 5 mm. Expanse of wings, 12 mm.

" Hab. : New Zealand, Wellington.

" The perfect insect appears in December and January."

I am unable to recognize this species. Neither Hudson nor Hare give any description or figures of the genitalia, and the above account, which is fuller than that of Hudson, might apply to any species in the genus.

Type probably in Mr. Hudson's collection.

Hudson writes of the biology as follows :

" The larva of *Helicopsyche* is very abundant in most running streams in the Wellington district. It constructs a spiral case so closely resembling a small snail-shell that similar cases found in Europe have deceived conchologists and led them to describe the cases as actual shells. The case constructed by the New Zealand insect is about $\frac{3}{16}$ inch in diameter. The whorls are rather flattened, and the inner portion of the spiral is smooth, and composed of extremely minute sand grains ; further out the sand-grains become coarser, and near the orifice of the case they are much larger, and give that portion of the structure a somewhat irregular appearance.

" The enclosed larva is very elongate, curved and specially adapted for inhabiting a spiral tube. Its length when full grown is about $\frac{3}{16}$ inch. The head is rather large, oval, light-reddish-brown. The prothorax is also reddish-brown, horny, and highly polished. The meso- and metathorax are dull green tinged with reddish-brown, and clothed with a few isolated bristles, the sides of the latter segment being

furnished with hair-bearing tubercles. The abdomen is bright green and very shining. The first abdominal segment is furnished with an extremely large dorsal hump. The anterior legs are very short, the intermediate and posterior pair of moderate length. There are no visible respiratory filaments. The segments of the abdomen are very cylindrical. The terminal segment has two rather feeble claws.

"These larvae are found in the streams throughout the entire year. In mid-winter they are very abundant, but so minute are the cases that it requires a very close scrutiny to discover them. They are often secreted in the depressions on some of the larger stones in the bed of the stream, and in these situations we may sometimes find clusters of fifty or a hundred cases. As the season advances the cases become larger, and in warm weather the larvae are very active, pulling their cases after them in all directions. On the approach of any moving object they may be observed detaching themselves from the stones with great celerity, and drifting down-stream like so many small pebbles. These tactics would no doubt preserve them from many enemies, but nevertheless large numbers of the larvae are devoured by trout, as we find their heliciform cases very numerous in the stomachs of fish taken in streams, where the insects are abundant. The mature larva fixes its case very firmly to a large stone in the bed of the stream, generally selecting for this purpose a depression in the rock or stone. When finally anchored, the larva, after having closed the orifices of the case, changes into a pupa inside.

"The pupa has the head small, pale brown, with the eyes prominent and yellowish-brown. The thorax is dull green. The wings are elongate, bright green, and curved upwards towards their extremities. The abdomen is elongate, pale green, with nine visible segments, curved upwards towards the tip; there is a slender black line on each side. The antennae and legs are also curved in the same way as the wings and abdomen, so that the whole insect fits perfectly into its heliciform case.

"The pupa leaves the case and swims about in the water for some hours before emergence. The perfect insect appears in December and January."

Saetotricha Brauer.

Saetotricha Brauer, 1865, *Verh. Z.-B. Ges. Wien*, **15** : 416.
Saetotricha Brauer, 1866, *Reise Novara*, p. 24, pl. 1, fig. 8.
Saetotricha Ulmer, 1907, *Gen. Insect.*, **60a** : 95, pl. 11, fig. 99.

♂ Unknown. ♀, *Spurs* 2, 2, 4, long and strong; hind tibia in its distal half thickened. *Antennae* shorter than the fore wing; basal joint somewhat longer than the head, thick, following joints, with the exception of the second, long, joints of the last fourth short; antennae feebly notched beneath. *Head* above, on the hinder part, with two strongly hairy warts (similar to those in *Helicopsyche*). *Maxillary palpi* with a very long basal joint, the others much shorter, together only slightly longer than the first joint. *Wings* narrower than in *Helicopsyche*, particularly the hind wing. Venation, as in *Helicopsyche*, difficult to make out under the pubescence. The first apical fork of the anterior wing rather longer, and in the posterior wing, which has the middle of the costal margin definitely produced, the fifth apical cellule reaches much further basally than the succeeding cross-vein, which runs to fork no 5.

Type species.—*Saetotricha ptychopteryx* Brauer, 1865.

Saetotricha ptychopteryx Brauer.

Saetotricha ptychopteryx Brauer, 1865, *Verh. zool.-bot. Ges. Wien*, 15 : 416.
Saetotricha ptychopteryx Brauer, 1866, *Reise Novara* : 25, pl. 1, fig. 8.
Saetotricha ptychopteryx Ulmer, 1907, *Gen. Insect.*, 60a : 95, pl. 11, fig. 99.

Brauer describes the species as follows :

"♀ nigra, capite callis rufis, fusco-cinereo hirsutis ; antennis griseis, fusco-annulatis, apice fuseis : palpis cinereo-testaceis, cinereo-hirsutis ; trochanteribus testaceis, femoribus flavido-cinereis, apice testaceis, tibiis tarsisque testaceis. Alis anticis fusco-cinereis, lanugine aurea irregulariter striatis et ad marginem apicalem

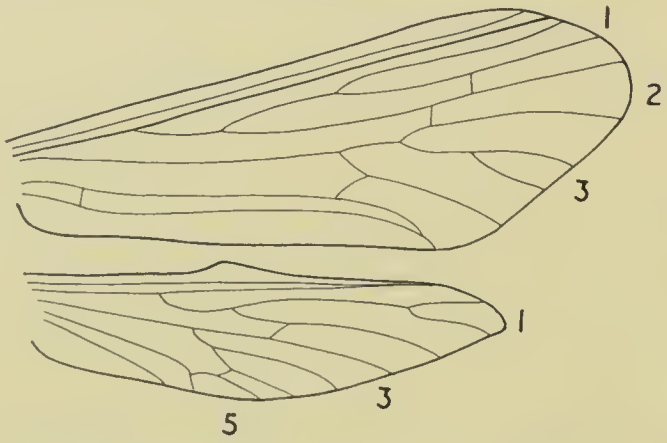

Fig. 49.—*Saetotricha ptychopteryx* Brauer. ♀. Wings (after Ulmer).

maculatis. Venis pallidis. Alis posticis hyalinis, apice cinereis, nigro-flavidoque ciliatis et hirsutis. Abdomine nigro-flavidocingulato, pilis flavis.

" Long. corp. $3\frac{1}{2}$–4 mm.

" Long. al. sup. 6 mm.

" Patria : Australia, Sidney. December."

I am not acquainted with this species, which was described from a female example. It appears to be allied to *Helicopsyche*, particularly in the neuration of the posterior wing.

Pycnocentrodes Tillyard.

Pycnocentrodes Tillyard, 1924, *Trans. N. Zeal. Inst.*, 55 : 307–308.

Tillyard describes the genus as follows :

"Allied to *Pycnocentria* MeL. from which it differs by the absence of the longitudinal fold in forewings of male, and the consequent normal structure of the radial sector in both sexes. The radial cell is present, and is of a somewhat narrowed, elongate form, basal portion being particularly narrowed. In some cases the stem R_{2+3} may be weakened or obsolescent, so that the radial cell is incomplete above (as in *P. olingoides* Till.), but venation is always very distinct from that of *Pycnocentria*, where all the branches of Rs, M and Cu_1 come off direct from longitudinal fold. Stem of R_{2+3} in hindwing of male also weakened or obsolete, leaving radial cell

open above. Apical forks of forewing all present, as in *Pycnocentria** ; in hindwing, only 1, 2 and 5 present, as also in *Pycnocentria*. No longitudinal fold in hindwing, of male. Tibial spurs 2, 2, 4. Maxillary palpi of male short and hairy, not projecting beyond end of first antennal segment.

" *Genotype.—Pycnocentrodes chiltoni* Tillyard."

KEY TO SPECIES OF *Pycnocentrodes*.

1. Smaller species, the males expanding about 12 mm. to 14 mm. . . . 2.
–. Larger species, the males expanding about 19 mm. to 22 mm. . . . 3.
2. Fore wing a medium brown-testaceous, with an area of pale golden-yellow hairs forming a faint fascia below pterostigma and descending as far as Cu_{1b} *P. chiltoni* Tillyard (p. 85).
–. Fore wing nearly black in life, dark fuscous in the dried insect, with bright golden patches near the base and also in the wedge-shaped area between Cu_1, Cu_{1b} and 1A . . . . . *P. aureola* McLachlan (p. 81).
3. Hairs of fore wing uniformly fulvous ; penis of male deeply bifid *P. olingoides* Tillyard (p. 87).
–. Hairs of fore wing almost entirely fuscous ; penis of male not bifid *P. hamiltoni* Tillyard (p. 86).

Pycnocentrodes aureola (McLachlan) (figs. 50–52).

Pycnocentria aureola McLachlan, 1868, *Journ. Linn. Soc. Lond. Zool.*, **10** : 200, 212, pl. 2, fig. 4.
Pycnocentria aureola McLachlan, 1873, *Ann. Mag. N. H.*, (4) **12** : 40.
Pycnocentria aureola Hutton, 1899, *Trans. N. Zeal. Inst.*, **31** : 239.
Pycnocentria aureola Hudson, 1904, *N. Zealand Neur.* : 69–70.
Pycnocentria aureola Ulmer, 1907, *Gen. Insect.*, **60a** : 96.
Pycnocentrodes pulchella Tillyard, 1924, *Trans. N. Zeal. Inst.*, **55** : 310, pl. 19, fig. 15 ; text-fig. 24. **Syn. nov.**

McLachlan describes the species as follows :

" *P. evectae* affinis, sed abdomen maris haud lobatum.

" Long. corp. $1\frac{3}{4}$–$2\frac{1}{2}$''' ; exp. alar. 6–9'''.

" *Head—antennae* yellow, with fuscous annulations ; the basal clothed above with pale primrose-yellow hairs, beneath with black hairs ; *vertex* blackish, clothed with pale primrose-yellow hairs springing from a rounded flattened tubercle placed on each side, the hairs from each being directed inwards ; *maxillary palpi* clothed with golden-yellow hairs ; *labial palpi* fuscescent ; *eyes* blackish brown.

" *Thorax—prothorax* with few pale-yellow hairs ; *meso-* and *metathorax* blackish fuscous, hairless.

" *Wings—anterior wings* grey, clothed with golden-yellow hairs, but with two or three hairless spaces (perhaps accidentally rubbed) on the disk and apical portion, which appear darker than the clothed parts ; the longitudinal impressed fold absent or scarcely evident ; fringes blackish and yellow intermingled : *posterior wings* dark smoky grey, with dense blackish-grey hairs ; the subcostal fold evident but not conspicuous ; fringes grey.

" *Legs* yellow, the tibiae and tarsi with adpressed blackish hairs.

"*Abdomen* fuscous above, reddish fuscous beneath. In the ♂ there is no ventral or dorsal lobe ; app. sup. long, narrow, the apex being obtuse, slightly dilated and

* I believe fork no. 4 to be absent, at least in the ♀, as in *Pycnocentria*.—D. E. K.

turned downwards, yellow : app. inf. more slender and equal in length to the sup. app., curved strongly inwards : penis long, reddish testaceous, on each side with a needle-shaped sheath, the points of which approximate.

" Christchurch, Canterbury (Fereday) ; Auckland (Edwards), 3 ♂, 1 ♀, the latter in bad condition and without abdomen."

[A ♂ from Christchurch, bearing the label " Type " in McLachlan's handwriting, is hereby designated the *type*.—D. E. K.]

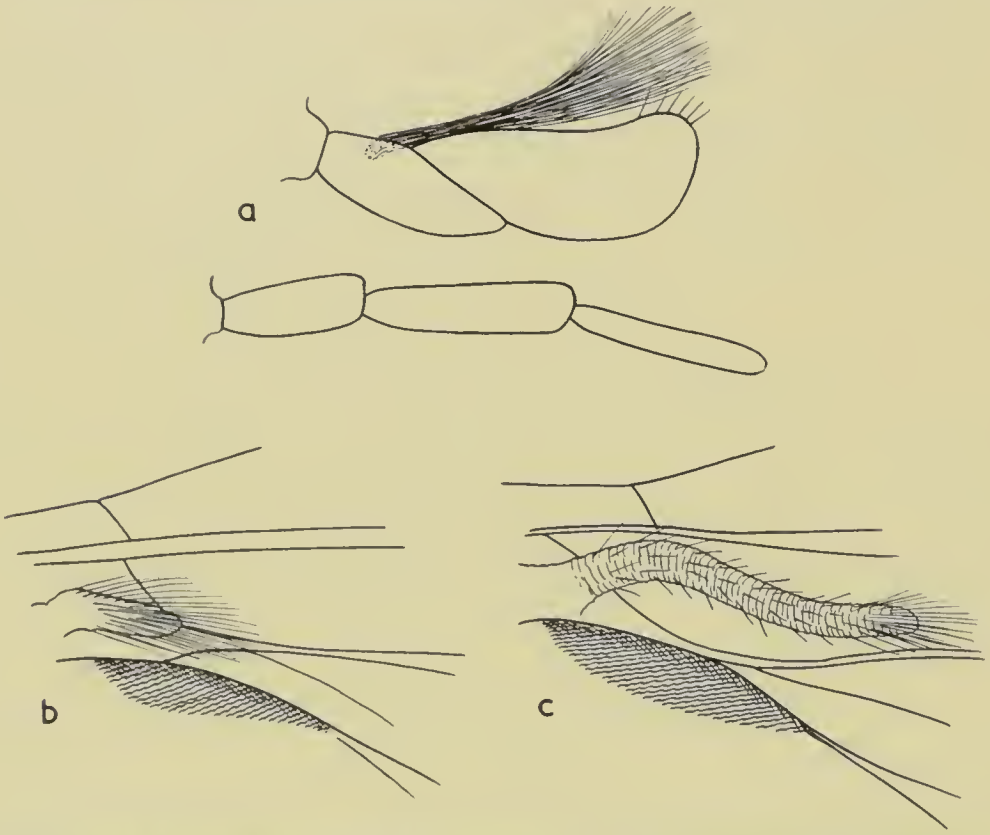

FIG. 50.—*Pycnocentrodes aureola* (McLachlan). ♂. *a*, maxillary and labial palpi ; *b*, scent-organ of anterior wing ; *c*, the same, expanded, from another specimen.

To McLachlan's description it may be added that the *maxillary palpi* are membranous and clearly two-jointed ; apical joint very large and separated from the basal joint by a transverse suture ; from this joint, on the inner surface towards the base, arises a brush of dense black hairs which lie between the palpi and the face : a scent-organ (?) is situated at the base of the anterior wing, consisting of an extensile, membranous filament fringed with yellowish hairs.

A further description of the genitalia is here given made from an example cleared in KOH.

Genitalia, ♂.—Apical margin of the ninth tergite produced at its centre in a small, strongly chitinized knob ; on each side are large, irregular superior appendages, whose inner margins at the apices are turned down and under ;

at the sides of the appendages are small triangular projections. Upper penis-cover broad, apex slightly excised ; outer basal angles produced in sinuous hooks curving downward and tailward. Penis with a dilated apex, furnished dorsally with widely-outstretched long spurs, so that, from above, the apex is

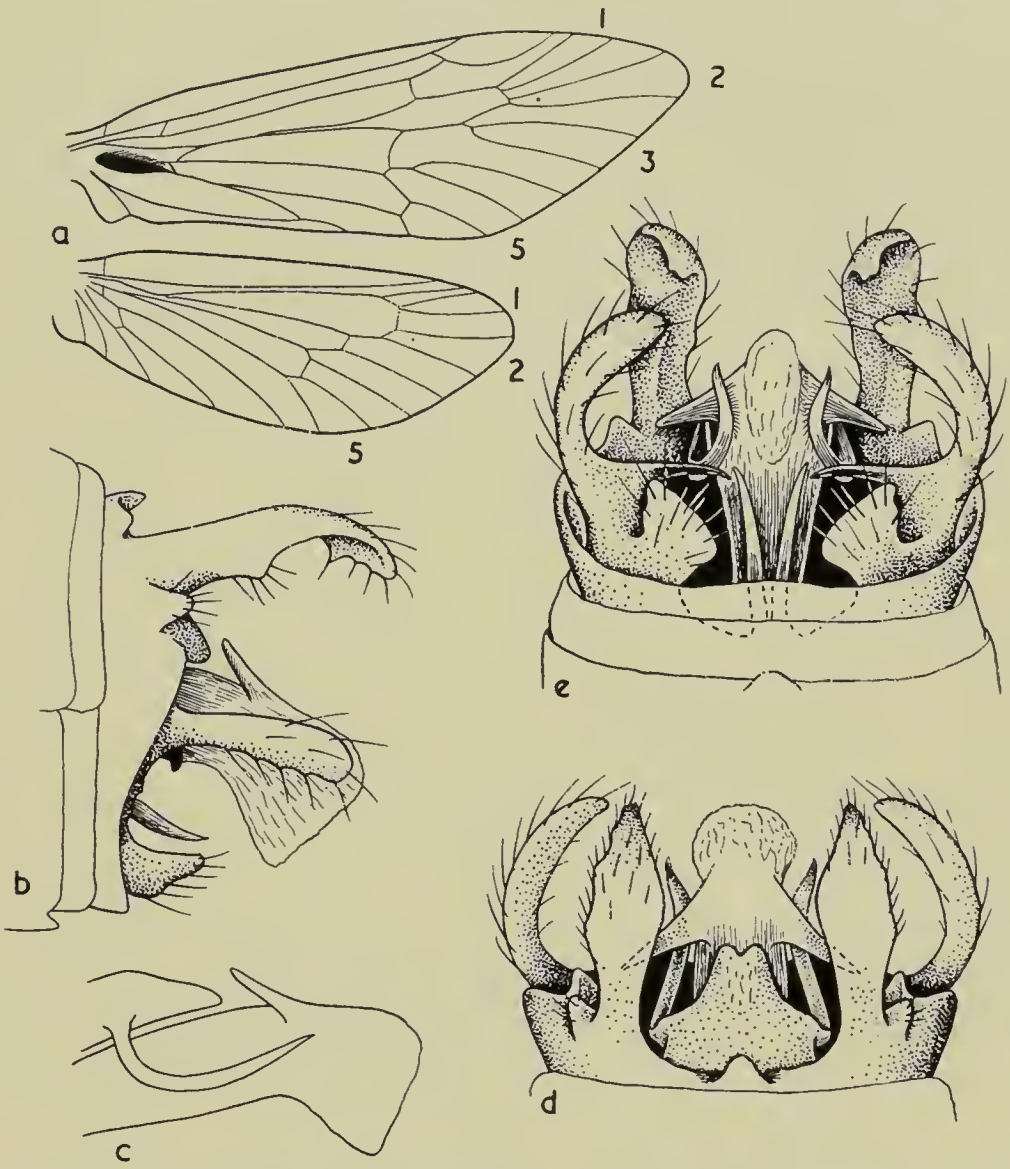

FIG. 51.—*Pycnocentrodes aureola* (McLachlan). ♂. *a*, wings ; *b*, genitalia, lateral ; *c*, penis and upper penis-cover, lateral ; *d*, genitalia, dorsal ; *e*, ventral.

triangular with produced basal angles. Inferior appendages four-branched, from above and beneath, apical branch curving inwards ; midway along the inner margin is a long, spine-like branch ; lower branch short with a broad, truncate apex ; fourth branch spine-like, arising from the upper and inner margin of the produced base so that the branches of the two appendages are

close together with slightly diverging apices. A short, rounded process to the seventh sternite.

Length of the anterior wing, ♂, 8 mm. ; of the ♀, 10 mm.

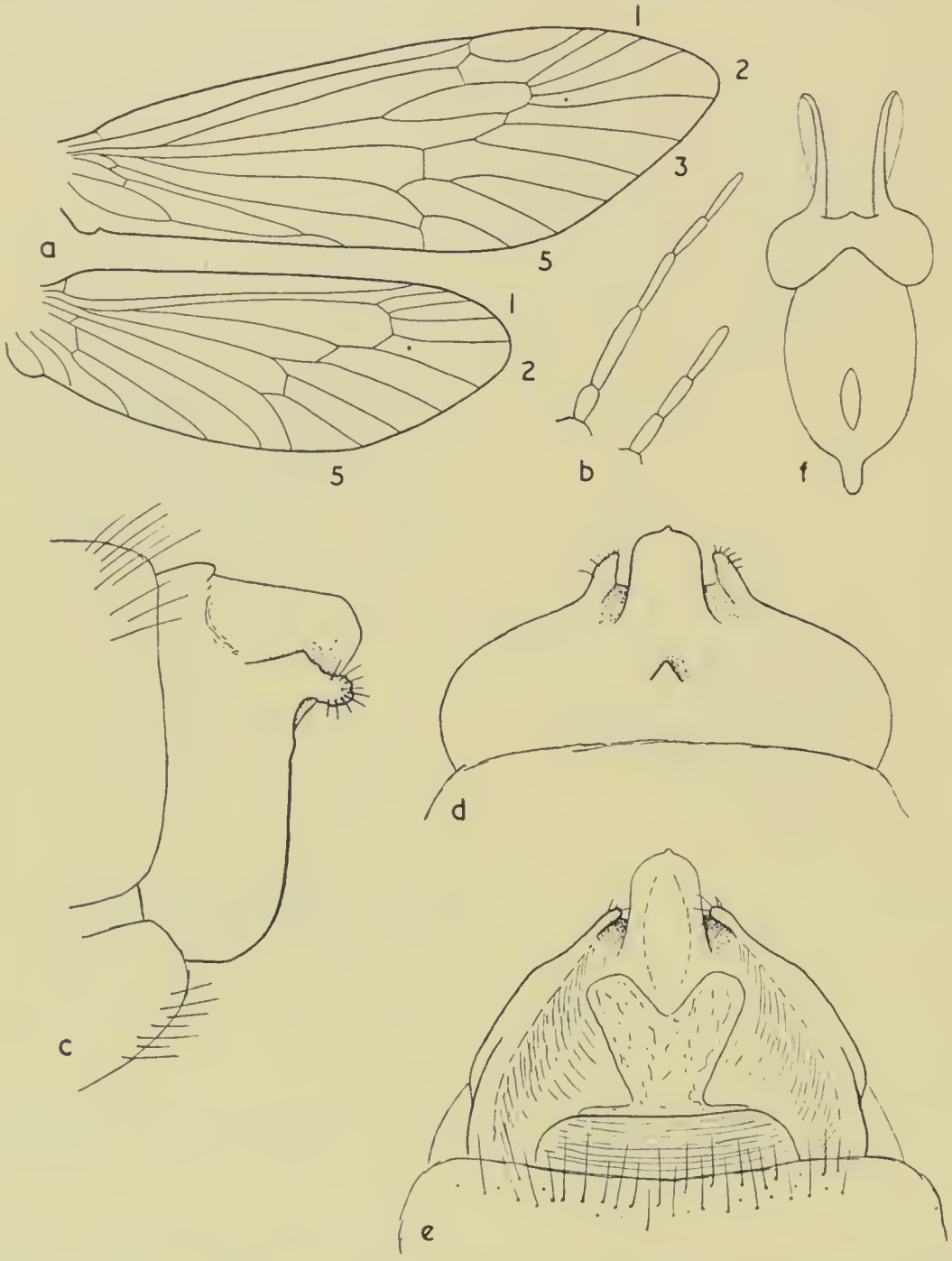

FIG. 52.—*Pycnocentrodes aureola* (McLachlan). ♀. *a*, wings ; *b*, maxillary and labial palpi ; *c*, apex of abdomen, lateral ; *d*, dorsal ; *e*, ventral ; *f*, vaginal structure, ventral.

I am unable to agree with McLachlan that there is no ventral process in the ♂.

[♀. Venation of *anterior wing* follows the pattern of *Pycnocentria*, but fork no. 2 is sessile. It is more complete than in the ♂, where the stem of the media is either obsolete or fused with Rs for most of its length. Forks nos. 1, 2, 3 and 5 present. Posterior wing as in ♂; forks nos. 1, 2 and 5 present.

Genitalia.—Ninth segment from above with a small, median, elevated triangle, and beyond it a prominent, narrow, rounded lobe, with a minute projection at its centre. From the side this lobe appears as a truncated triangle, and on each side of it arises a small finger, directed distally, and set with hairs at its apex. From beneath, the sides of the ninth segment (and also the lower margin of the dorsal lobe) are extended inward across the apex of the abdomen in lightly chitinized triangular plates, and the ventral margin of the segment appears as a short, slightly ridged, transverse plate. Vaginal structure as figured. No ventral processes.—D. E. K.]

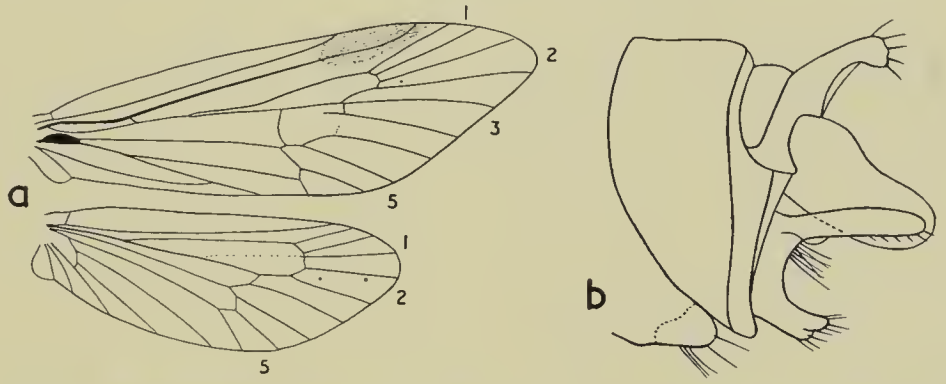

Fig. 53.—*Pycnocentrodes chiltoni* Tillyard. ♂. *a*, wings; *b*, genitalia, lateral (after Tillyard).

A preparation of a paratype of Tillyard's *Pycnocentrodes pulchella* shows that this species is identical with McLachlan's *Pycnocentria aureola*. As the neuration of *aureola* differs very considerably from that of the type species of *Pycnocentria* I deem it advisable to transfer the species to Tillyard's genus.

The perfect insect appears from November to March.

Pycnocentrodes chiltoni Tillyard (fig. 53).

Pycnocentrodes chiltoni Tillyard, 1924, *Trans. N. Zeal. Inst.*, **55** : 309, pl. 19, fig. 14, text-figs. 21–23.

Tillyard describes the species as follows :

" ♂, total length, 4·5–5 mm. ; forewing 7–8 mm. ; expanse 13·5–16 mm.

" This insect shows a strong superficial resemblance to *Pycnocentria evecta* and *P. aureola* McL., its general form and coloration being much the same. It may be distinguished from them at once as follows : In both sexes the antennae are pale testaceous, strongly annulated with fuscous on all segments, and the pale-golden scaling of the forewing does not extend all over the wing, but is confined to the

sub-costa, the cubito-anal area, and a fascia extending across the wing from the pterostigma to Cu_{1b} ; in fresh specimens there is an irregular area slightly darker than the rest of the wing, just basad from this fascia, and sometimes curling round it in the form of the letter C. The male can at once be distinguished further by the absence of the darkly shaded longitudinal band of the forewing which is characteristic of the genus *Pycnocentria*. The female expands 16–18 mm., and is thus considerably larger than the male, but not so large as the female of *Pycnocentria evecta*. It resembles the male fairly closely, but the wings are of a paler colour, with a larger area covered with pale-golden hairs.

"*Types*.—Holotype male and series of three paratype males, Cass, Canterbury (6th January 1920, R.J.T.) ; allotype female and series of three paratype females and one male, Nelson (allotype, 29th November 1920, A. Philpott) : all in Cawthron Institute Collection."

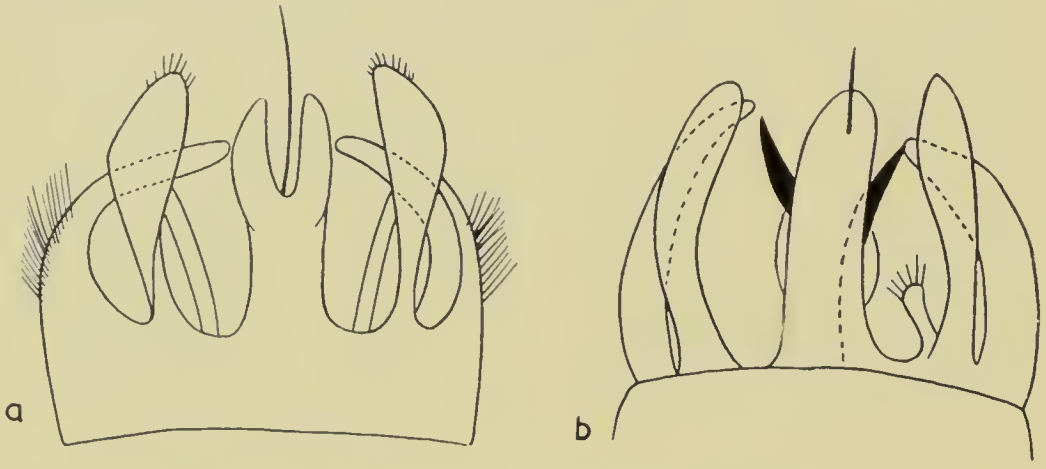

Fig. 54.—♂ Genitalia, dorsal, of *a*, *Pycnocentrodes olingoides* Tillyard, *b*, *P. hamiltoni* Tillyard (after Tillyard).

Pycnocentrodes hamiltoni Tillyard (fig. 54*b*).

Pycnocentrodes hamiltoni Tillyard, 1924, *Trans. N. Zeal. Inst.*, **55** : 311–312, pl. 19, fig. 17 ; text-fig. 25*b*.

Tillyard describes the species as follows :

"Closely similar in size and shape to the preceding species, but the male can at once be distinguished by the colour of wings, which are semi-transparent brownish-fuscous, with numerous short brown hairs, and a long patch of golden hairs occupying the cubito-anal space of forewing. The wings also show some pinkish-brown iridescence. The antennae are pale yellowish-brown, with medium brown annulations ; the abdomen is pale olive-green ; legs yellowish-brown ; appendages dark brown, shaped as shown in fig. 54*b* ; penis not bilobed but with a short bristle projecting from near its end, and a pair of large sharp spines standing out on either side of it ; the pre-anals less broadly foliaceous than in preceding species ; gonapophyses forcipate, somewhat stouter than in preceding species. The eighth sternite carries a process. Female very closely similar to that of preceding species, but having termen of forewing slightly more arched, and radius more strongly curved within pterostigma ; also abdomen shows a tinge of greenish. From female of *Olinga*

feredayi it can at once be distinguished by the difference of venation : radius in *Olinga* runs straight through pterostigma and curvature of branches of M and Cu is different.

" *Types.*—Holotype male and allotype female, Pouto River between Tokaanu and Lake Roto-Aira, North Island (27th November, 1919) ; both in Cawthron Institute Collection."

Pycnocentrodes olingoides Tillyard (fig. 54*a*).

Pycnocentrodes olingoides Tillyard, 1924, *Trans. N. Zeal. Inst.*, **55** : 310–311, pl. 19, fig. 16.; text-fig. 25*a*.

Tillyard describes the species as follows :

" ♂. Total length, 5 mm. ; forewing, 10 mm. ; expanse, 21·5 mm.

" *Head*, *thorax* and *abdomen* brown ; the epicranium with rich golden hairs ; antennae three-fourths as long as forewing, fulvous annulated with darker brown ; mouth-parts entirely fulvous. Legs entirely fulvous.

" *Wings.*—Forewing covered with short fulvous hairs ; veins rich brown. Hind-wing subhyaline, slightly infuscated, with rich brown venation, and fulvous hairs along Sc and R_1 ; fringe along costa to apex fulvous, along posterior border pale-greyish. Anal appendages of the dried insect as in fig. 54*a*, pre-anals rather broadly foliate, with narrow bases ; penis deeply bifid, and carrying a long projecting bristle nearly twice as long as each lobe of the bifurcation ; gonapophyses rather short, forcipate. Sternite 8 with a broad process extending from it.

" ♀. Closely resembling the male both in size and colour, but at once distinguished from it by the slender, five-segmented maxillary palpi and absence of the complicated genital appendages ; forewings also are slightly narrower at base.

" *Types.*—Holotype male and allotype female, Gouland Downs, Nelson Province (7th February, 1922, R.J.T.) ; both in Cawthron Institute Collection ; also a paratype ♂ from the same locality.

" Both sexes of this insect very closely resemble female of *Olinga feredayi* McL. ; hence the specific name given. They are best distinguished from it by the more fuscous hind wings of the latter, and by the fact that in the genus *Olinga* many of the hairs of the fore wings are flattened down into the form of narrow scales."

Conoesucus Mosely.

Conoesucus Mosely, 1936, *Proc. Zool. Soc. Lond.*, **1936** : 408–409.

Ocelli absent. *Spurs* 2, 2, 4 ; *maxillary palpi* ♂ three-jointed, basal and third joints very small, of about the same length and each about a third the length of the second joint. Labial palpi, basal joint shorter than the second, which is about equal to the third ; *maxillary palpi* ♀, basal joint small and rounded, second long, third slightly longer than the first, fourth slightly longer than the third, fifth about as long as the third ; labial palpi similar to those of the male. *Anterior wing* rather broad ; male with a fold along the radius ; discoidal cell in this sex longer and narrower than that of the ♀. Forks nos. 1, 2, 3 and 5 present in both sexes. Posterior wing broad and rounded ; discoidal cell in both sexes short but shorter in the ♀ ; forks nos. 1, 2 and 5 present.

Genitalia, ♂.—The ninth segment is produced to form a pair of broad pro-

cesses ; superior appendages small ; upper penis-cover present ; inferior appendages branched. A broad process to the seventh sternite in the ♂.

Type species.—*Conoesucus fromus* Mosely, 1936.

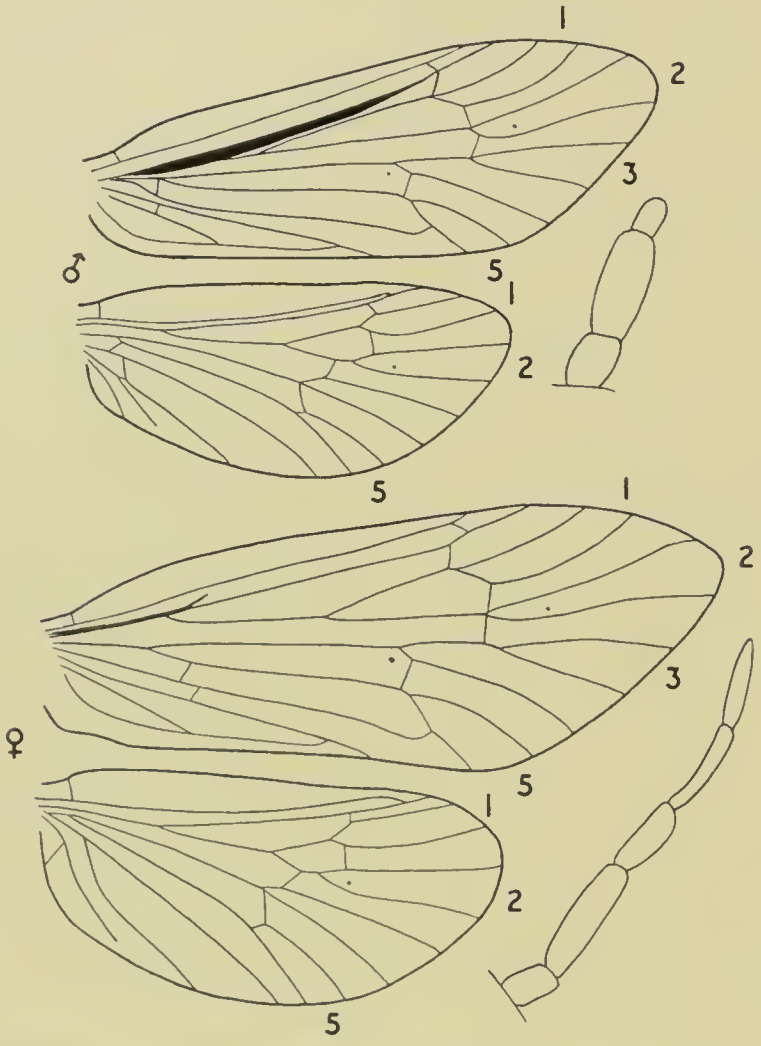

Fig. 55.—*Conoesucus fromus* Mosely. ♂♀ wings and maxillary palpi.

Key to Species of *Conoesucus*, Males.

1. Wings mainly black or dark fuscous, gold only in a streak along post-costa . 2.
–. Wings golden below radius from base to anastomosis, fuscous above radius and beyond anastomosis . . . . . *C. semiauratus* sp. n. (p. 91).
2. Inner basal angle of inferior appendages strongly produced in a finger, as seen from below . . . . . *C. fromus* Mosely (p. 88).
–. Inner basal angle of inferior appendages not so produced *C. norelus* sp. n. (p. 90).

Conoesucus fromus Mosely (figs. 55–56).

Conoesucus fromus Mosely, 1936, *Proc. Zool. Soc. Lond.*, **1936** : 409–410, figs. 35–41.

Head black ; oculi yellowish brown ; *antennae* black, rather serrate on the inner sides ; *legs* dark fuscous, clothed with rather lighter hairs ; *wings* very

dark fuscous, nearly black, anterior with a streak of gold towards the base along the post-costa.

Genitalia, ♂.—At the centre of the dorsal margin of the ninth tergite arises a pair of processes, with spatulate apices and a deep, narrow cleft with a

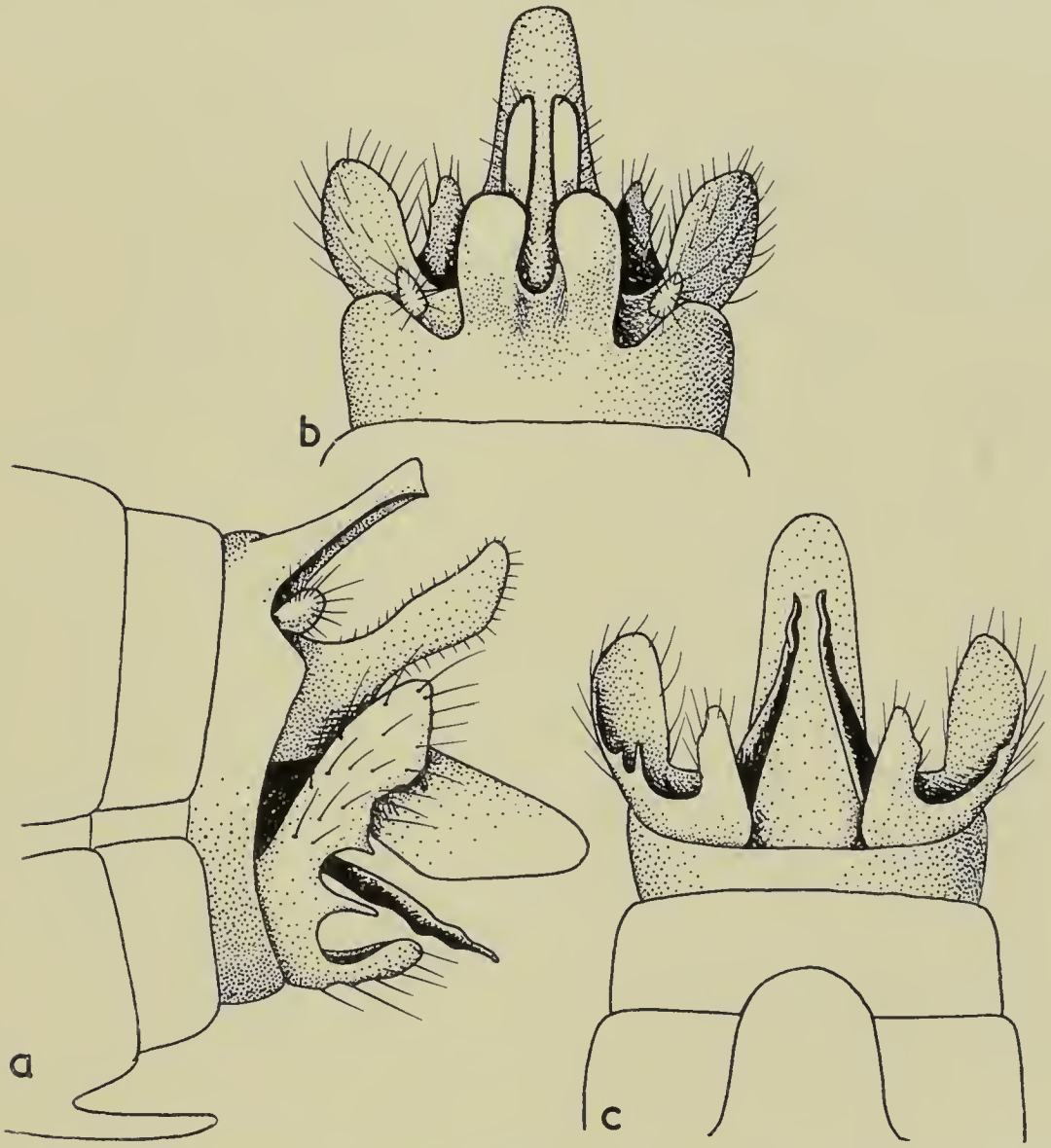

Fig. 56.—*Conoesucus fromus* Mosely. ♂ genitalia. *a*, lateral ; *b*, dorsal ; *c*, ventral.

rounded base between them ; superior appendages very small, from the side, rounded ; upper penis-cover in the form of two long, parallel plates close together ; penis large, directed downward, with a pair of gimlet-like sheaths beneath ; inferior appendages two-branched, broad, concave, with various irregular excisions along the outer margin as seen from the side, dissimilar in the two appendages ; at the base of each appendage arises the smaller

second branch, which is finger-shaped ; a broad spatulate process to the seventh sternite.

Length of the anterior wing, ♂, 7 mm. ; ♀, 8 mm.

Tasmania : Miena, Great Lake, xii.1929, H. M. Stephen, 1, 1930 ; xii.1930, C. Parker ; North Esk, Tillyard coll. ; Shannon River, 12.xii.1936, New Norfolk, xi.1938, J. W. Evans.

Type, ♂, Miena, Great Lake, xii.1930.

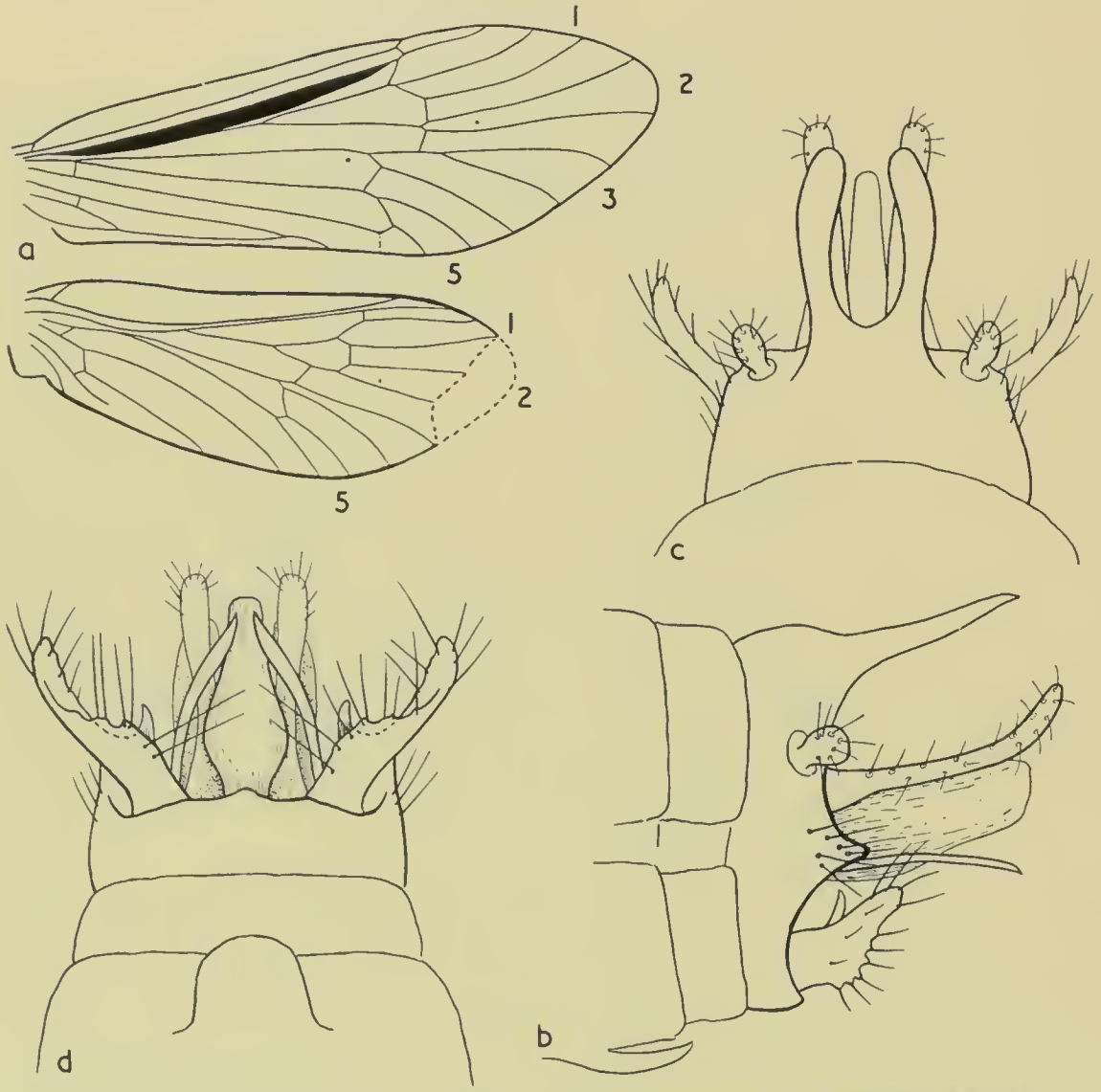

Fig. 57.—*Conoesucus norelus* sp. n. ♂. *a*, wings ; *b*, genitalia, lateral ; *c*, dorsal ; *d*, ventral.

Conoesucus norelus sp. n. (fig. 57).

Insect black, very similar to *Conoesucus fromus* Mosely, but smaller and differing in details of genitalia and neuration.

Genitalia, ♂.—From above, the centre of the dorsal margin of the ninth

segment is produced in pair of spatulate processes, placed close together and joined at the base ; superior appendages very small and rounded. Upper penis-cover in the form of two long, narrow, fringed plates, slightly upturned from the side ; between these lies the penis, which is slightly shorter ; the gimlet-shaped spines, which, in *fromus*, I suggested were penis-sheaths, are smooth in *norelus*. It is doubtful whether they are really penis-sheaths and they may even represent a lower penis-cover. The inferior appendages are short, with serrate outer margins, directed upwards ; the lower branch shown in *fromus* is replaced by a small, acute spur arising in the centre and directed inwards. From beneath, the centre of the margin of the ninth segment is produced in a small triangle and the side-pieces are much more acute at their apices than in *fromus* ; at the base of the side-pieces are a few, very strong, black hairs. Ventral process of the seventh sternite broad, spatulate and closely adpressed.

Length of the anterior wing, ♂, 5 mm.

TASMANIA : New Norfolk, iii.1938, 1 ♂, J. W. Evans, mounted as a balsam preparation.

Conoesucus semiauratus sp. n. (fig. 58).

Insect dark fuscous. *Wings : Anterior*, golden below the fold of the radius (in the ♂) from the base as far as the anastomosis, fuscous above the radius and beyond the anastomosis to the apex. *Posterior wing*, fuscous ; *antennae* dark fuscous, nearly black ; *legs* dark ochraceous. Since the insect was collected as far back as 1884, it is very probable that the parts here described as fuscous were black or nearly black in life.

Genitalia, ♂.—From above, the centre of the dorsal margin of the ninth segment is produced in a pair of spatulate processes, placed close together and joined at their bases ; superior appendages small, round, situated in an excision of the margin of the ninth segment ; upper penis-cover cleft, very broad at the base, apices of the forks somewhat upturned from the side. The pair of spine-like processes are formed as in *C. fromus*, namely, gimlet-shaped at their apices ; a second pair of spines arise from the proximity of their bases and lie close beneath and under them, but with their apices curving outwards and away. Inferior appendages are upturned ; outer margins serrate, the lower branch reduced to a mere angular projection. Ventral margin of the ninth segment roundly excised ; the process of the seventh sternite broad and spatulate.

The structure of the seventh sternite is peculiar and gives the appearance of being composed of two parts welded together, with the base of the ventral process lying in a triangular excision. This formation is common to a whole group of these Sericostomatid species.

Length of the anterior wing, ♂, 7 mm.

AUSTRALIA : New South Wales, Bathurst, 8.ii.1884, 1 ♂, from the McLachlan Collection, abdomen mounted in balsam.

This species differs from *C. fromus* in the pattern of the wings.

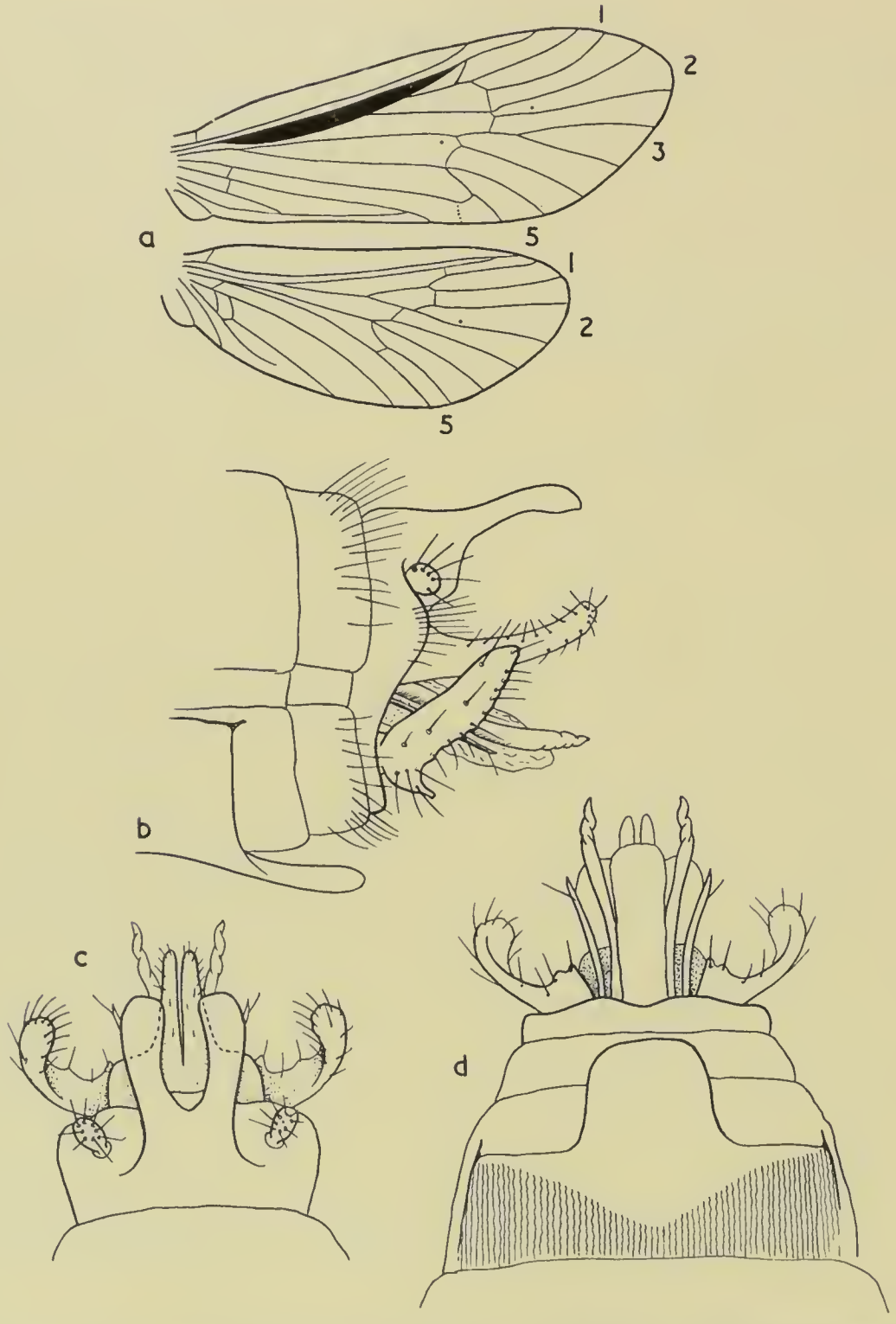

Fig. 58.—*Conocsucus semiauratus* sp. n. ♂. *a*, wings; *b*, genitalia, lateral; *c*, dorsal; *d*, ventral.

Lingora Mosely.

Lingora Mosely, 1936, *Proc. Zool. Soc . Lond.*, **1936** : 406–407.

In the ♂, *antennae* with a large basal joint, of which the apex is oblique, and the remaining joints small ; second joint shorter than the third, fourth about the same length as the second, each of the remaining joints slightly longer than the fourth. In the denuded antennae, mounted in balsam, each joint with the exception of the first and second and the last nine is annulated towards its apex with a white ring. *Maxillary palpi* membranous and single-jointed, with the extreme apex curled backward ; labial palpi with the second joint longer than the first and shorter than the third. In a balsam preparation the two basal joints appear membranous and the terminal joint strongly chitinized. *Wings* in the type species clothed with dense yellow pubescence and with various folds in the anterior (♂) as indicated in the figure. Forks nos. 1, 2, 3 and (?) 5 present in anterior wing, nos. 1, 2 and 5 in posterior. *Spurs* 2, 2, 4. A ventral process to the antepenultimate sternite. Female unknown.

Type species.—*Lingora aurata* Mosely, 1936.

KEY TO SPECIES OF *Lingora*, MALES.
(*Lingora plicata* Banks not included.)

1. Discoidal cell of posterior wing much shorter than its footstalk
L. aurata Mosely (p. 93).
–. Discoidal cell of posterior wing about as long as its footstalk
L. coomata sp. n. (p. 96).

Lingora aurata Mosely (figs. 59–60)

Lingora aurata Mosely, 1936, *Proc. Zool. Soc. Lond.*, **1936** : 407–408, figs. 30–34.

Head dark fuscous ; oculi reddish brown ; *thorax* reddish-brown. *Antennae* and *legs* clothed with yellowish pubescence ; femora of the posterior pair (denuded and mounted in balsam), showing large transparent patches centrally on the upper surfaces. *Anterior wing* thickly clothed with yellowish hairs ; in the ♂ there are various folds lined with bright yellow, thickened hairs and scales. Other characters given in the generic description.

Genitalia, ♂.—From above the ninth tergite is produced at the centre of its basal margin in a strong, leaf-shaped process ; the segment beneath this process is trapezoidal, with the lower apical margin extended beneath and on each side of the penis in two triangular plates. The apex of the segment is produced in two blade-like processes, approximating each other at their bases, then slightly diverging, particularly as to their outer margins, finally slightly approaching each other at the apices ; towards the base of these blades is a pair of fairly long superior appendages (?) with slender stems and clavate apices. Penis stout, fleshy and slightly downcurved. Inferior appendages, from the side, are broad and rhomboidal with slender stems ; they appear as extensions of the lower margin of the ninth segment. The centre of the lower

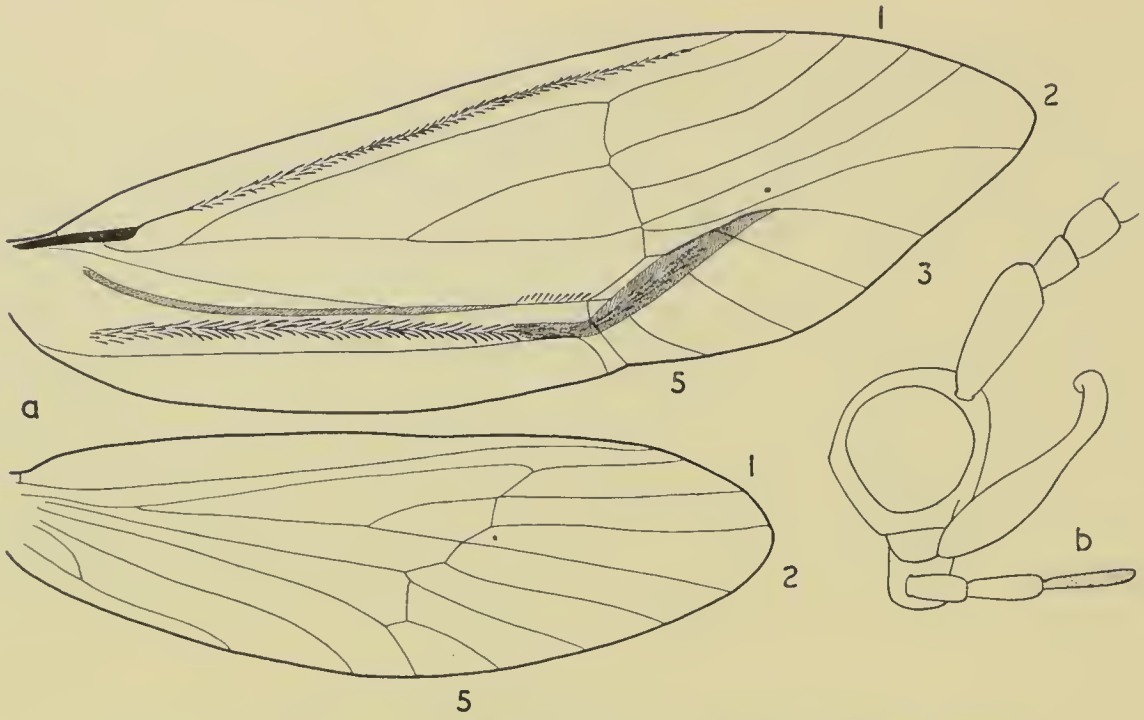

FIG. 59.—*Lingora aurata* Mosely. ♂. *a*, wings; *b*, head, lateral.

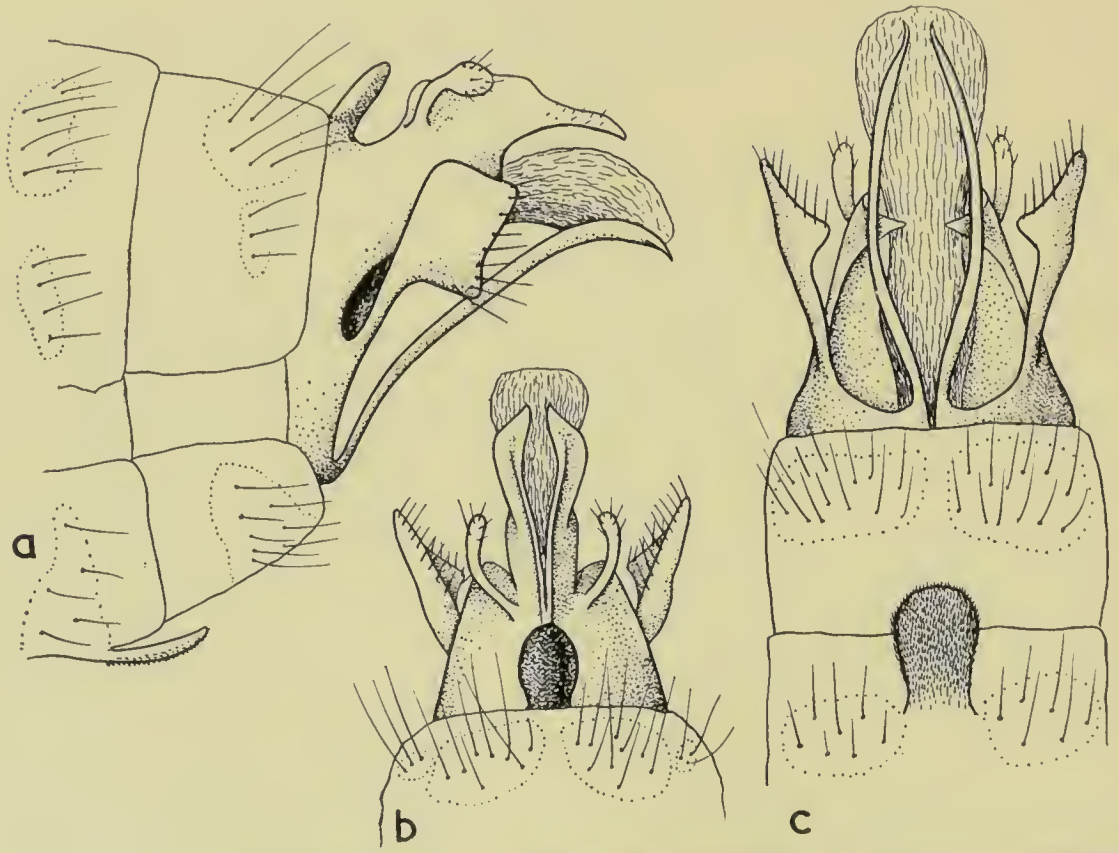

FIG. 60.—*Lingora aurata* Mosely. ♂ genitalia. *a*, lateral; *b*, dorsal; *c*, ventral.

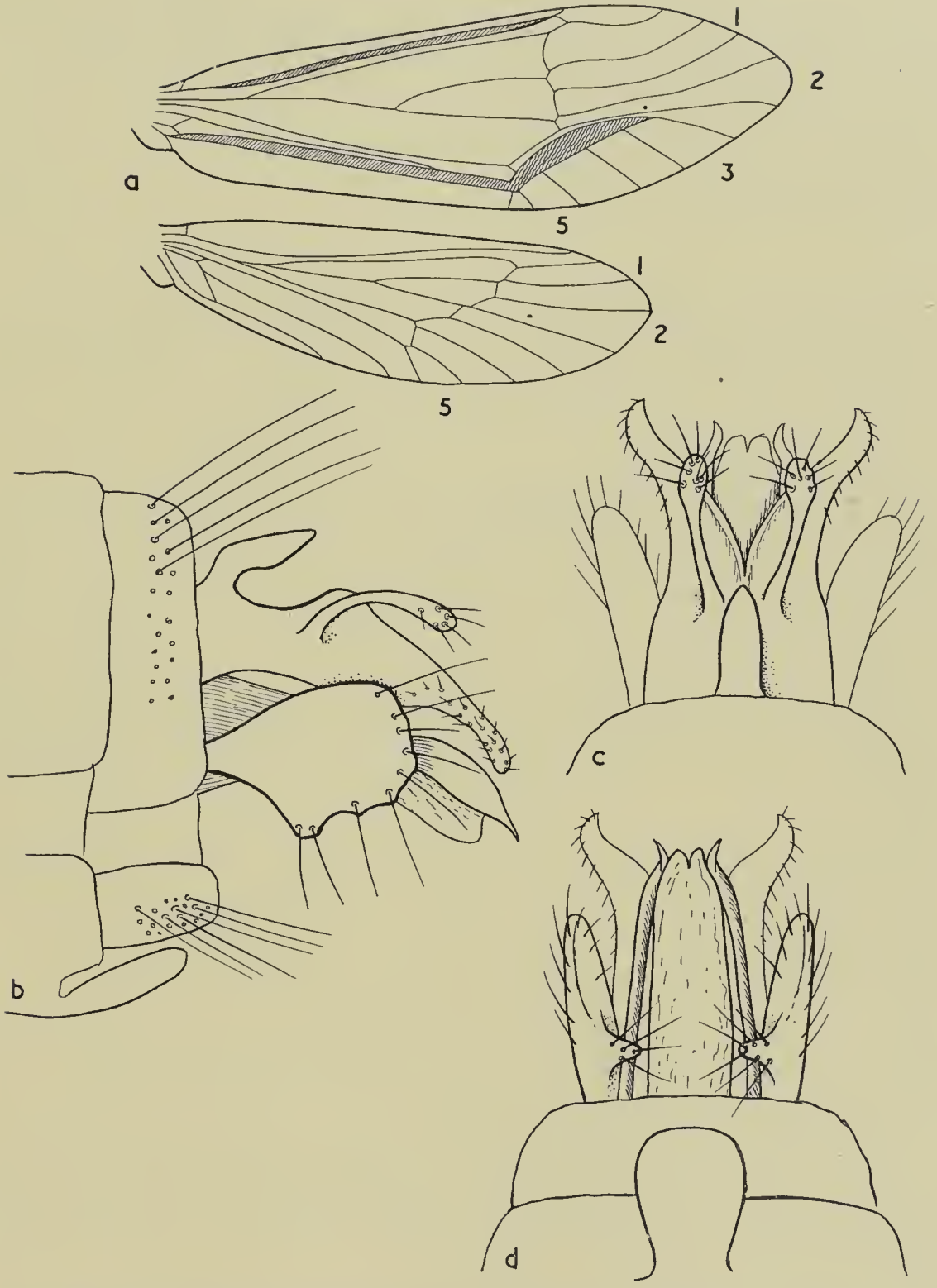

FIG. 61.—*Lingora coomata* sp. n. ♂. *a*, wings ; *b*, genitalia, lateral ; *c*, dorsal ; *d*, ventral.

margin of this segment is interrupted, each half being produced in a long, slender, and slightly curved spine directed upward and tailward ; apex very acute. A broad spatulate process to the antepenultimate segment, which, in dried examples, is coloured bright orange ; under the microscope, this process is seen to be densely covered with fine, minute spinules.

Length of the anterior wing, ♂, 6 mm.

Tasmania : Miena, Great Lake, xii.1930, C. Parker (*type*) ; New Norfolk, iii.1938, J. W. Evans.

Lingora coomata sp. n. (fig. 61).

Insect dark fuscous. *Antennae* and *legs* ochraceous. *Anterior wing* with the folds lined with dark fuscous hairs, and with a broad area covered with short, golden hair between them ; the sector crosses this area and, being clothed with fuscous, broadened hairs, makes a conspicuous dark streak across it.

Genitalia, ♂.—From above, the ninth segment is produced at the centre of its distal margin in a small pointed process ; beneath and joined to it is a long, furcate process, no doubt the upper penis-cover. Towards the base of each fork, on the upper surface, is a small branch with clavate apex ; beyond these the forks separate widely and then the apices are slightly inturned to form a pair of callipers ; from the side the process is slightly down-turning. The penis is straight and lies between the forks. Inferior appendages arise from narrow stems and the apices are much dilated ; there is an angular projection of the lower margin. As in *L. aurata*, the ninth segment is interrupted ventrally, each half being produced in a long, slender branch with a dilatation before the acutely pointed apex ; a large spatulate process to the seventh sternite.

Length of the anterior wing, ♂, 5·5 mm.

Australia : New South Wales, Cooma, 18.i.1885, 1 ♂, from the McLachlan Collection, abdomen mounted in balsam.

The differences between this species and the type species may best be appreciated by reference to the figures.

Lingora plicata Banks (fig. 62).

Lingora plicata Banks, 1939, *Bull. Mus. Comp. Zool. Harv.*, **85** : 480, figs. 37, 44.

Banks describes the species as follows :

" Head black, hairs on palpi brown, on vertex reddish to yellowish, basal joints of antennae are densely clothed with black hair, beyond the antennae are almost white for five segments, then brown, annulated with pale, but apical third is almost wholly dark ; mesonotum with some tawny hair ; legs mostly dark, base of tibia pale, and part of tarsus.

" Fore wing clothed with long, stout, black hair, in the male these especially dense on the swollen streaks, and on the medius near tip is an area of short stout, erect black hairs. Hind wing with finer black hairs.

" In fore wing the radial sector arises near base, the discal cell about three times as long as broad, fork one back on discal cell about width of cell, fork two broad at base on discal, fork three with pedicel one half of fork, the other venation in male is deranged by the posterior swollen streak ; in female fork one is back a shorter distance on cell, fork three very long, fork five short, anal running into cubital fork.

" In hind wing fork one and two back to cell, fork three a little long, fork five very short. In male hind wing there is no fork three.

The male has a spatulate projection at tip of the venter ; the genitalia are small ; a pair of sharp processes above, below is a rounded basal plate, and an elongate blunt penis.

" Fore wings 4·5 mm. long.

"From Barrington Tops, New South Wales, Australia, 5000 ft., 8 Feb. (Darlington)."

Type in Museum of Comparative Zoology, Harvard College, U.S.A.

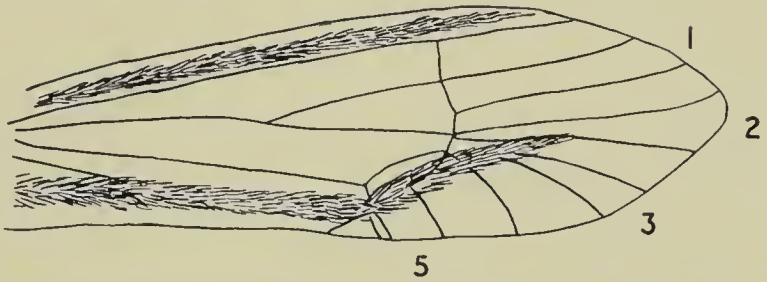

Fig. 62.—*Lingora plicata* Banks. ♂. Fore wing (after Banks).

Oeconesus McLachlan.

Oeconesus McLachlan, 1862, *Trans. ent. Soc. Lond.*, (3) **1** : 303.
Oeconesus McLachlan, 1868, *Journ. Linn. Soc. Lond. Zool.*, **10** : 211.
Oeconesus McLachlan, 1873, *Ann. Mag. N. H.*, (4) **12** : 39.
Oeconesus McLachlan, 1894, *Ent. Mon. Mag.*, (2) **5** : 238.
Oeconesus Hutton, 1899, *Trans. N. Zeal. Inst.*, **31** : 235.
Oeconesus Hudson, 1904, *N. Zealand Neur.* : 61–62.
Oeconesus Ulmer, 1907, *Gen. Insect.*, **60a** : 96–97.

McLachlan describes the genus as follows :

"*Male.*—Antennae about the length of the wings, basal joint short, and rather thick, not so long as the head ; head quadrate ; maxillary palpi oval-elongate, much swollen, curved up in front of the head, their apices, viewed from above, appearing as two rounded tubercles between the antennae, moderately hairy ; labial palpi with the basal joint short, second and third of equal length, long ; anterior tibiae with two short spurs, intermediate and posterior, each with four long unequal spurs.

"Anterior wings rather short and broad, very slightly hairy, the costa much arched, apical margin almost straight ; the costa from the base to the pterostigma is narrowly folded inwards ; discoidal cell long and narrow, the *ramus thyrifer* does not fork before the anastomosis, and from this cause there are only eight apical cells ; the anastomosis is complete and very oblique from the third apical cell, the lower part is not connected with the inner margin by a transverse vein, and the last apical cell is continued from the apex to near the base of the wing, the apical portion being very broad ; near the base of the third apical cell in all four wings is a small round hyaline spot ; posterior wings broad, folded ; discoidal cell short and triangular."

Type species.—*Oeconesus maori* McLachlan, 1862.

In 1894 McLachlan amended the original description as follows :

"♂. In the anterior wings there is a deep fold or groove commencing at the arculus on the inner margin, where it is very broad, extending to the thyridium, and thence continued obliquely : the neuration seems to defy comparison with a regular condition : the *sector radii* would seem to arise from the upper cubitus, which, in its turn, arises from the radius near its base (a condition that merits still further examination and confirmation !), and the apical neuration is equally extraordinary, especially the position of the 3rd apical cellule (which bears the " point " near its base common to that cellule). In the posterior wings there are indications, on the costal portion, of the fold on the anterior ; the neuration is more regular and the apical forks 1, 2 and 3 are present.

"♀. Neuration regular ; in the anterior the upper edge of the discoidal cell is straight ; apical forks 1, 2, 3 and 5 present : in the posterior apical forks 1, 2, 3 and 5 present."

In the *Sericostomatidae* neuration is frequently abnormal, and in the subfamily *Lepidostomatinae*, Trichopterists, by erecting new genera based upon differences, more or less important, in neuration, have almost arrived at a situation where every new species requires a new genus to contain it.

The genitalia amongst many of these insects are so similar that it is often difficult to find sufficiently distinctive characters, apart from neuration, by which to separate them.

It seems obvious now that a mistake has been made in the method of the classification in this family. Too much importance has been ascribed to neuration as a generic character. A far more simple arrangement could have been made if the generic characters had been selected from the form of the genitalia and the neuration considered as of specific instead of generic value.

To avoid, therefore, the erection of new genera allied to *Oeconesus*, all having a similar and hardly distinguishable form of genitalia, I propose to reverse the existing practice and to enlarge the generic characters, so that all these forms, some of which vary widely in neuration, may be contained in the one genus. It will be found that the variation in neuration will far better separate the species than the extremely obscure differences in parts of the genitalia.

Unfortunately, there is some doubt as to the characters of the type (*maori*), and McLachlan, who refers to the species three times, confuses the position in his last references.

Originally, in 1862, he mentions with regard to the neuration, that—

"in the anterior wing, the costa is narrowly folded over."

In his second reference, 1868, he gives a figure of the wings showing this fold. But in his third reference, 1894, he adds—

"there is a deep fold or groove commencing at the arculus . . . extending to the thyridium,"

There is a long series of what is apparently *maori* in the British Museum, one example of which, bearing a label in the handwriting of McLachlan himself, I select as the type. In all of these is the costal fold evident. In none of them is the fold at the arculus present.

I have taken the example bearing McLachlan's own label from which to make the following description of *maori*. This description may be taken as representing the main generic character.

Spurs 2, 4, 4. *Maxillary palpi* of the ♂ broad, upturned in front of the face, single-jointed. *Wings* broad ; anterior yellowish brown with numerous irrorations, coalescing in various parts of the wing to make larger spots or clouds of lighter colouring. Costa often narrowly folded over the sub-costa towards the base ; discoidal cell present. Apical fork no. 1 sometimes very long, overlapping the discoidal cell almost to its base, and in such cases, traversed by a weak cross-vein at about mid-way ; there is generally a slanting line of cross-veins at the anastomosis. Forks nos. 1 and 2 present in the anterior wing ; forks of the posterior wing variable. In the female forks nos. 1, 2, 3 and 5 present in both wings.

Genitalia, ♂.—Ninth dorsal segment produced in a quadrate plate, with a widely excised apical margin, to form two triangular lobes ; beneath each of these lobes is a rather narrower process with a rounded apex directed slightly upward, as seen from the side, possibly a superior appendage. Upper penis-cover large, narrowly excised to make two forks lying parallel and very close together. Inferior appendages three-jointed, a basal joint which is very stout and triangular, and two terminal joints arising from its inner surface, the one finger-shaped and membranous, the other more strongly chitinized, from the side, with the lower margin strongly dilated at the centre, apex slightly downcurved ; from beneath, wide, ridged and directed inwards. On each side of the penis is a rod-like, strongly chitinized process, possibly extensions of a lower penis-cover. Penis generally withdrawn, apex with a U-shaped excision ; penis-sheaths, from beneath, short, apices rounded and slightly divergent.

Short and triangular processes to the sixth and seventh ventral segments, that of the sixth the larger ; processes sometimes wanting.

Key to Species of *Oeconesus*, Males.

1. Anterior wing, apical fork no. 1 very long, overlapping nearly to base of discoidal cell, and traversed about midway by a weak cross-vein, giving the appearance of an additional discoidal cell . . . . . 2.
–. Anterior wing, fork no. 1 not very long, only overlapping the discoidal cell by about one-third or one-half of the length of that cell, and not traversed by a cross-vein . . . . . 3.
2. Anterior wing, costal margin folded over . . *Oe. maori* McLachlan (p. 100).
–. Anterior wing, costal margin not folded over . *Oe. zelandensis* sp. n. (p. 103).
3. Anterior wing, costal margin folded over ; posterior wing with apical fork no. 3 *Oe. similis* sp. n. (p. 103).
–. Anterior wing, costal margin not folded over ; no fork no. 3 in posterior wing *Oe. incisus* sp. n. (p. 104).

Oeconesus maori McLachlan (figs. 63–65).

Oeconesus maori McLachlan, 1862, *Trans. ent. Soc. Lond.*, (3) **1** : 303–304.
Oeconesus maori McLachlan, 1868, *Journ. Linn. Soc. Lond. Zool.*, **10** : 211, pl. 2, fig. 1.
Oeconesus maori McLachlan, 1873, *Ann. Mag. Nat. Hist.*, (4) **12** : 39.
Oeconesus maori McLachlan, 1894, *Ent. Mon. Mag.*, (2) **5** : 239.
Oeconesus maori Hutton, 1899, *Trans. N. Zeal. Inst.*, **31** : 335–336.
Oeconesus maori Hudson, 1904, *N. Zealand Neur.* : 62.
Oeconesus maori Ulmer, 1907, *Gen. Insect.*, **60a** : 97, pl. 12, fig. 103.

McLachlan describes the species as follows :

" *Male.*—Antennae pale ochreous ; eyes blackish, slightly reticulated with brassy ; head, thorax, and abdomen reddish-brown ; legs reddish-ochreous ; anterior

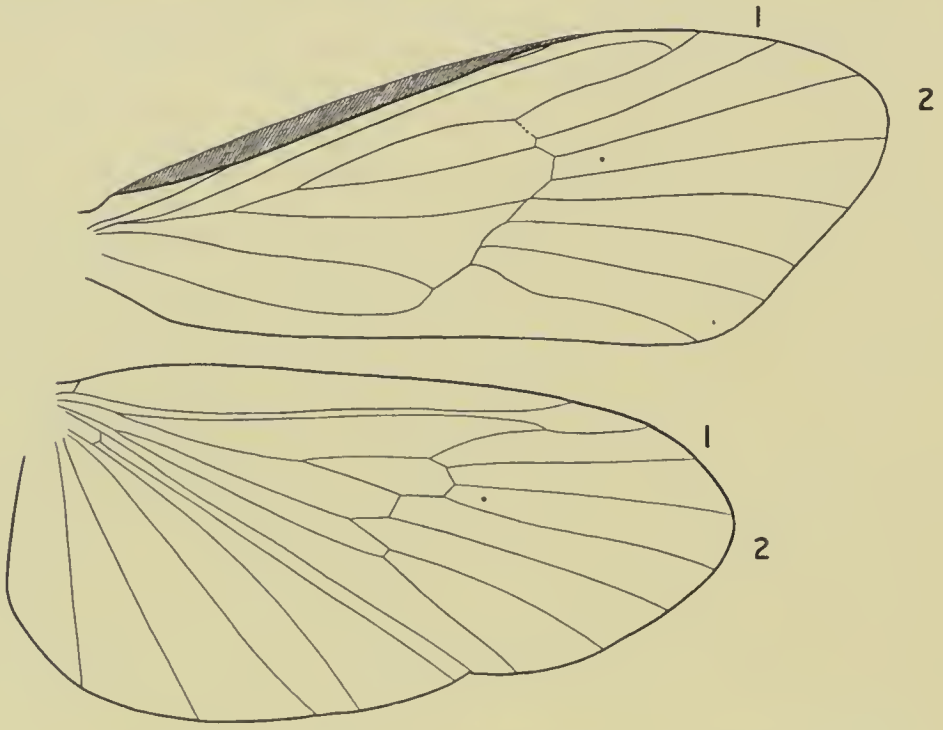

Fig. 63.—*Oeconesus maori* McLachlan. ♂ wings.

wings rusty-brown, thickly irrorated with whitish spots, which are larger towards the base ; on the inner margin are three elongated whitish spots, alternating with others of the dark ground-colour ; posterior wings sub-hyaline, tinged with brownish.

" Long. corp. 3½ lin. ; exp. alar. 10 lin.

" New Zealand."

In 1873 McLachlan describes the female as follows :

" ♀ larger (expanse 30 mm. as against 26 mm.). In the anterior wings the pale irrorations are smaller and more evenly distributed. A sharp triangular brown-tipped tooth on the ante-penultimate ventral segment. Last dorsal segment in the form of a triangular plate ; below it is a tubular piece, truncate at its apex, whence (viewed laterally) a rounded valve proceeds on either side, projecting slightly beyond the tube."

In a paper in the *Annals and Magazine of Natural History* of the same year he writes:

"I now possess the female of this insect; it differs from the male in its larger size; the neuration of the anterior wing is regular; and in the posterior wing there are two additional apical forks. The maxillary palpi are 5-jointed, the basal joint

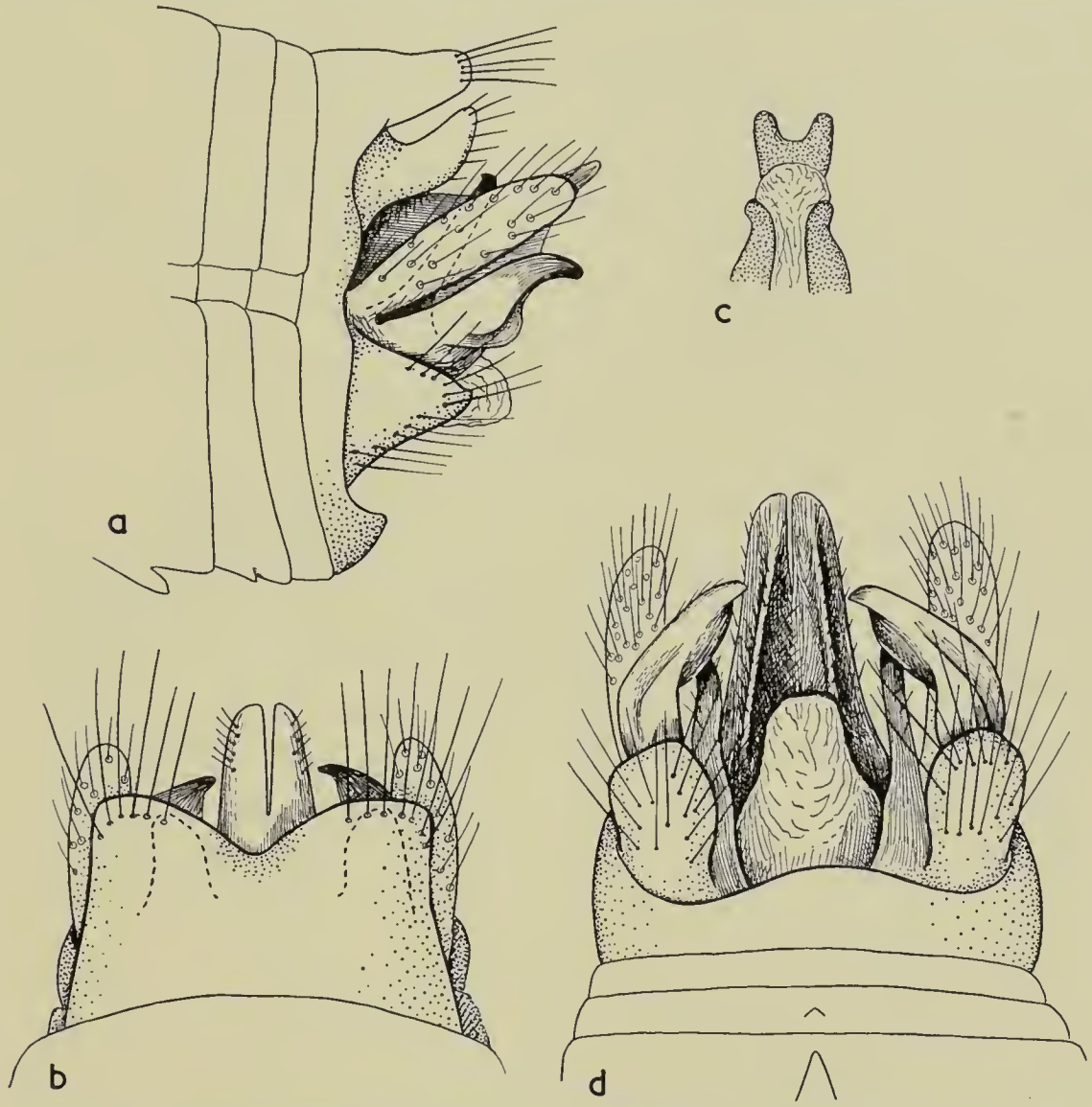

FIG. 64.—*Oeconesus maori* McLachlan. ♂ genitalia. *a*, lateral; *b*, dorsal; *c*, penis and sheaths, ventral; *d*, ventral.

very short, the second slightly longer, the third to fifth still longer and nearly equal *inter se*."

The original description was published without a figure. In 1868 McLachlan added a figure of the male wings, but it was not until 1894 that he gave any account of the genitalia, and this account, unaccompanied by any figures, was evidently made from the pinned examples.

I have therefore given (in the generic diagnosis) a fresh description of the *genitalia*, made from the abdomen of the type, cleared in caustic potash and now mounted in canada balsam. The figure of the wings given here is taken from another example, with precisely similar neuration and genitalia.

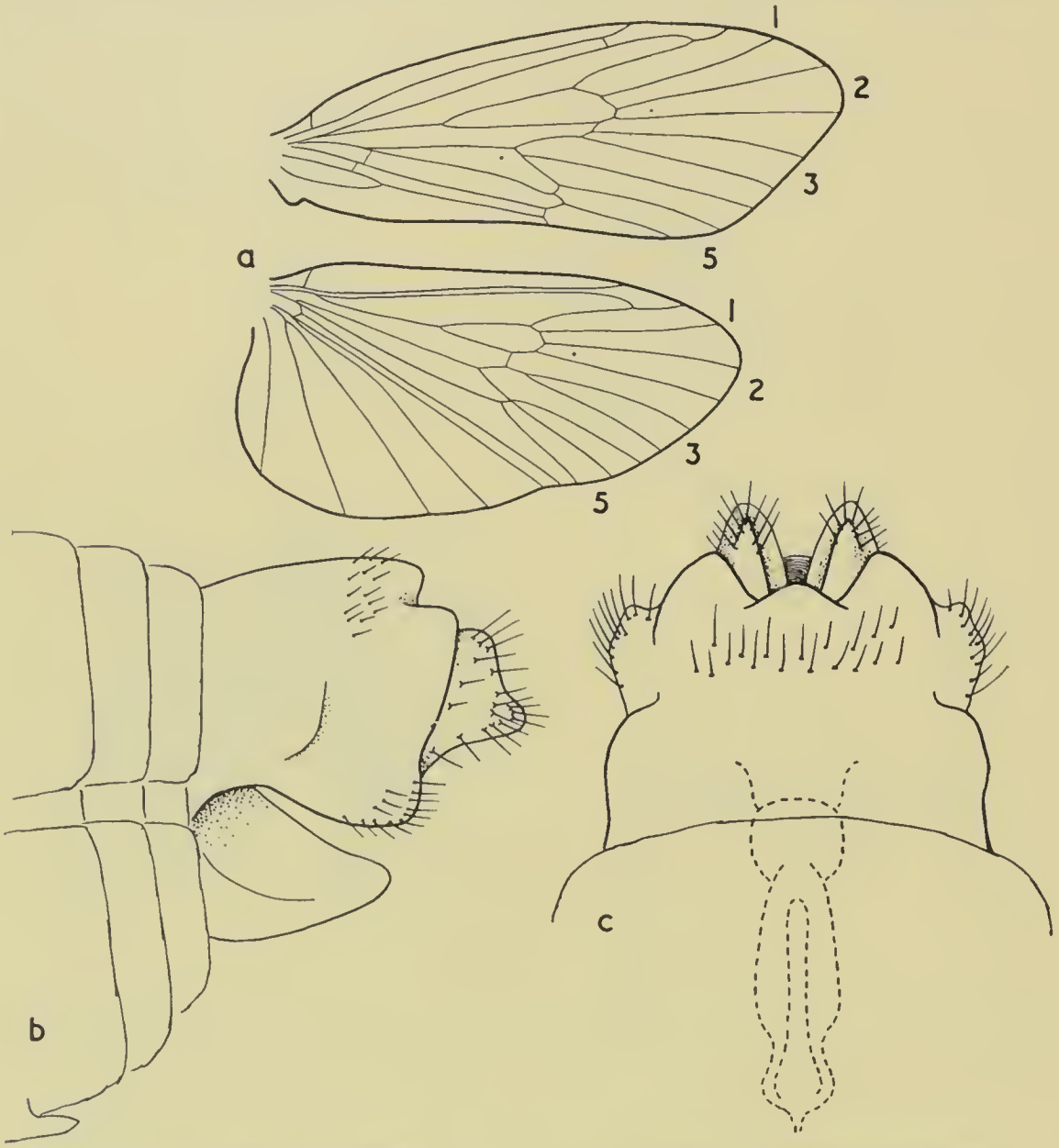

Fig. 65.—*Oeconesus maori* McLachlan. ♀. *a*, wings ; *b*, apex of abdomen, lateral ; *c*, dorsal.

Wings broad ; anterior with the costal margin narrowly folded over the sub-costa towards the base ; discoidal cell closed. Apical forks nos. 1 and 2 present ; fork no. 1 very long, overlapping the discoidal cell almost to its base, and traversed about midway by a weak cross-vein ; in the posterior wing, discoidal cell closed, forks nos. 1 and 2 present.

Short, triangular processes to the sixth and seventh ventral segments, that of the sixth the longer, otherwise genitalia as detailed in the generic diagnosis.

Genitalia, ♀.—From above, distal margin of the terminal segment widely excised with the base of the excision slightly produced in a wide triangle ; beneath the margin of the segment is a pair of narrow, triangular processes which, from the side are deep, distal margin concave, lower angle rounded ; these processes form the tubular-piece. From beneath, there is a large plate with rounded distal margin below the tubular-piece ; a process to the sixth sternite.

Length of the anterior wing, ♂, variable ; ♀, 15 mm.

Type ♂ and numerous examples in the British Musem (N.H.) from various localities in New Zealand.

Hudson records :

" The perfect insect appears from October to April, and frequents the foliage on the margins of rivers and streams. It is sometimes attracted by light."

Oeconesus zelandensis sp. n. (fig. 66).

Colour and general appearance as in *O. maori*. *Maxillary palpi* with the apex of the single joint obliquely rounded. In the *anterior wing* the costa is not folded over the sub-costa ; fork no. 1 very long and traversed by a cross vein about mid-way ; in the posterior the cross-vein uniting the lower margin of the discoidal cell with the fifth apical sector is nearly in line with the base of fork no. 2, whereas in *maori* it arises from nearer the middle of the cell.

In the ♂ *genitalia* the excision of the dorsal plate is deeper and more acute at its base than in *maori*.

Length of the anterior wing, ♂, 14 mm.

New Zealand : White Rock, xi.1919, 1 ♂ (*type*) ; N. Island, Ohakune, 20.iii.1922, 1 ♂, T. R. Harris.

The differences between this species and *O. maori* are detailed in the above comparative description.

Oeconesus similis sp. n. (fig. 67).

In the *anterior wing* the yellow irrorations are more plentiful than in *Oe. maori*, and coalesce towards the apex to make two well-defined yellow bands, the inner the larger ; there is a triangular yellow spot towards the centre of the wing, and three large yellow spots along the posterior margin. Apical fork no. 1 not very long ; in the *posterior wing* apical forks nos. 1, 2 and 3 are present. In the male *maxillary palp* the apex is produced in a small finger, and there is a small membranous joint arising at the base of this produced part.

The ♂ *genitalia* differ mainly in the form of the dorsal plate and lobes ; these arise from beneath a slight ridge in the ninth segment and are directed widely outward, with rounded apices ; the membranous branch of the inferior

appendages is rather smaller than in *maori*, the penis differs slightly in shape, and the ventral processes of the sixth and seventh sternites are of approximately the same length.

Length of the anterior wing, ♂, 16 mm.

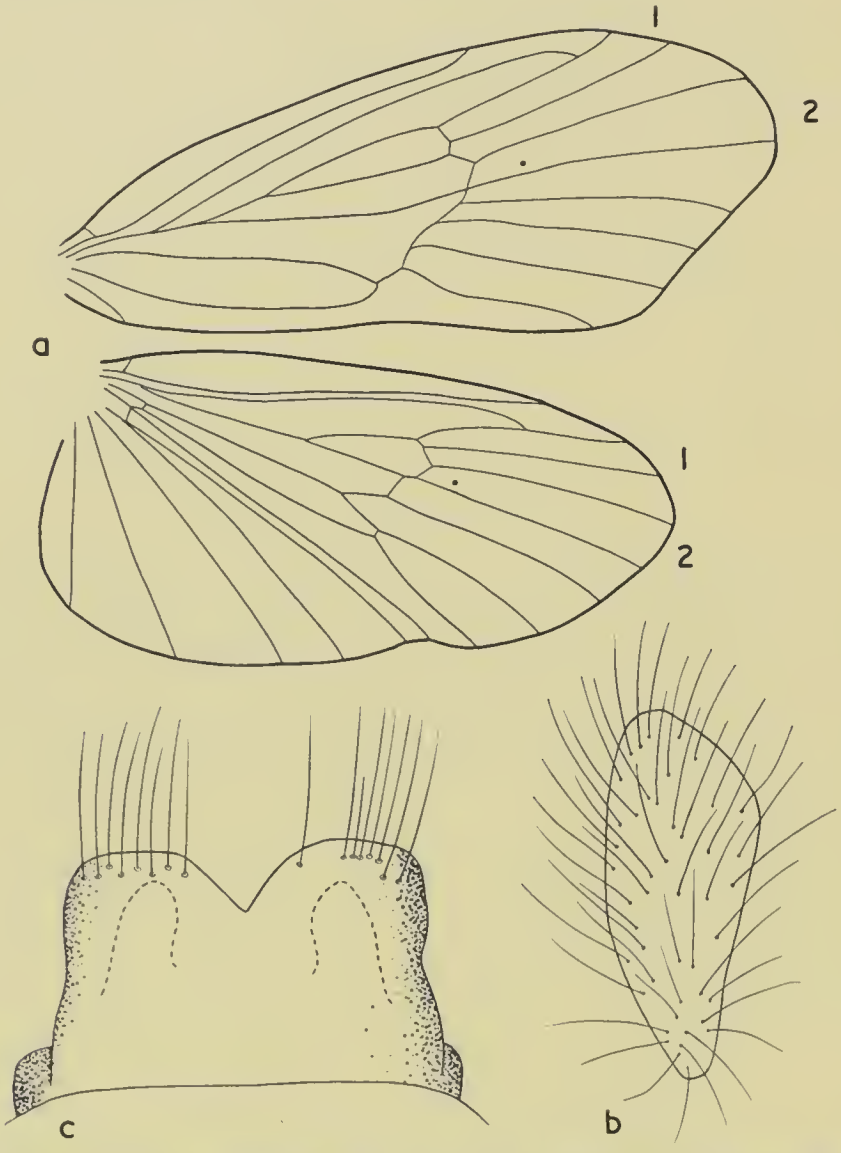

Fig. 66.—*Oeconesus zelandensis* sp. n. ♂. *a*, wings; *b*, maxillary palp; *c*, dorsal plate from above.

New Zealand: Mt. Arthur, Flora R., i.1920, i.1929, 3 ♂, Flora Camp, 2800 ft., 17.i.1920, 2 ♂, G. V. Hudson; Cass, 7.1.1920, R. J. Tillyard.

Type, ♂, from Flora R., i.1920.

Oeconesus incisus sp. n. (fig. 68).

In general appearance ochraceous and very similar to *Oeconesus maori* McLachlan. In the ♂, *maxillary palpi* ochraceous, upturned and lying close

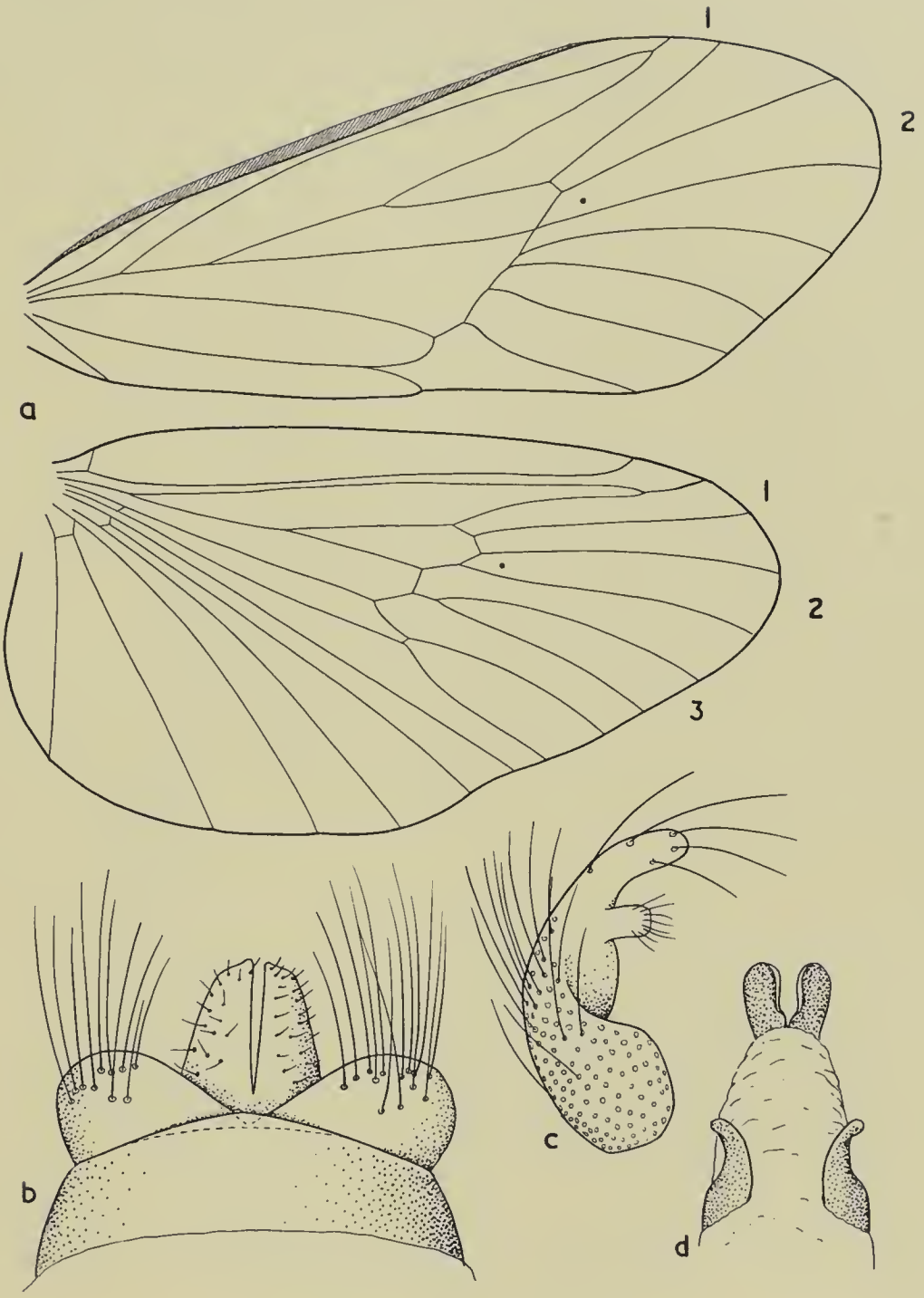

FIG. 67.—*Oeconesus similis* sp. n. ♂. *a*, wings ; *b*, dorsal plate and upper penis-cover, dorsal ; *c*, maxillary palp ; *d*, penis and sheaths, ventral.

against the face, probably single-jointed ; outer surface convex, bearing long, rather widely-spaced black hairs ; apex produced in a small finger. *Wings* broad, *anterior* stramineous with numerous yellow spots which coalesce in various parts, making two conspicuous, yellow spots at the centre of the posterior margin and a third less conspicuous spot nearer to the base ; numerous spots

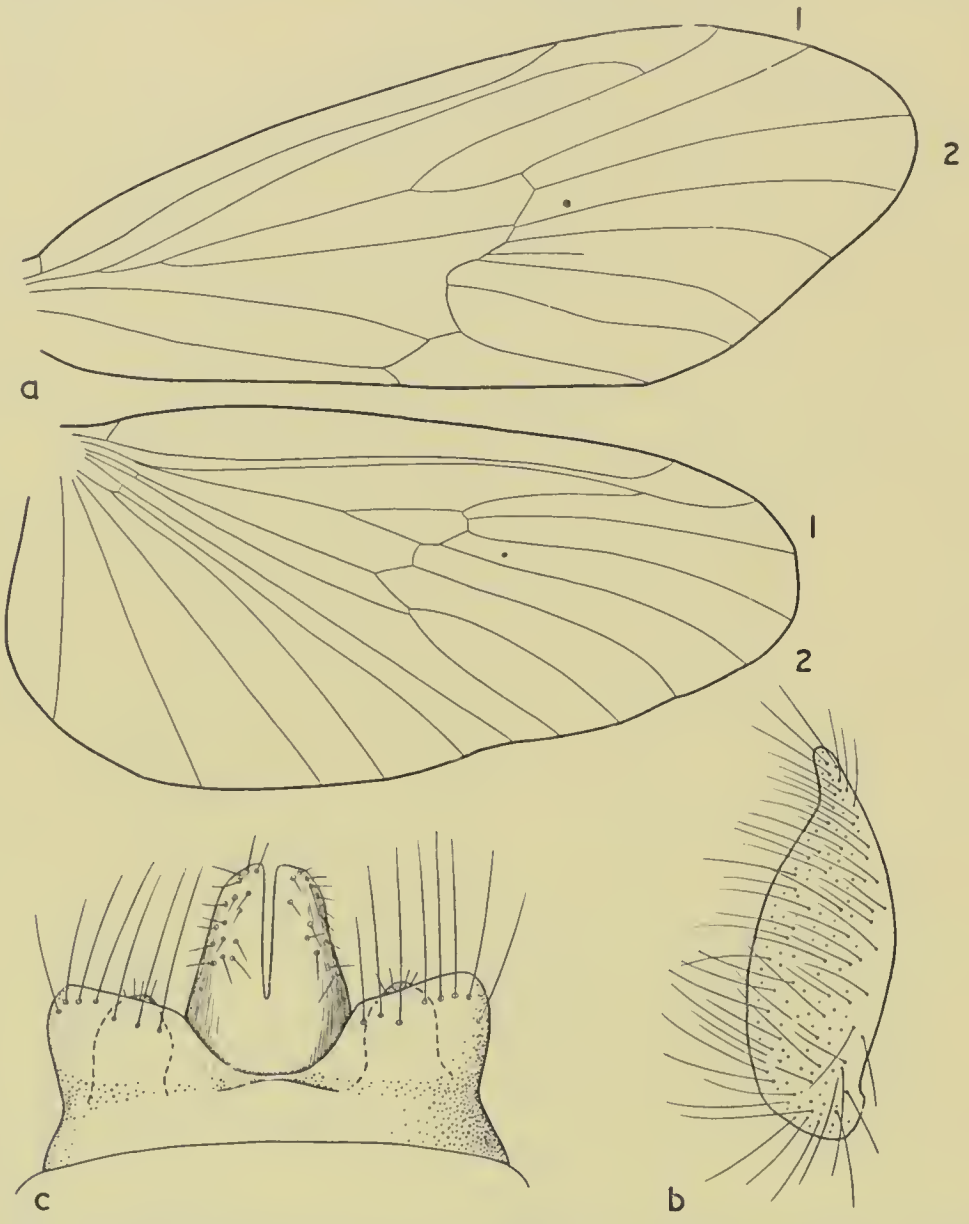

FIG. 68.—*Oeconesus incisus* sp. n. ♂. *a*, wings ; *b*, maxillary palp ; *c*, dorsal plate and upper penis-cover, dorsal.

coalesce also to give a white, cloudy appearance to the apical cellules. Discoidal cell wanting ; fifth, sixth and seventh apical cellules much longer than in *maori*, so that they make an apical excision in the internal cell on which

they are based. Discoidal cell of the *posterior wing* short ; apical forks nos. 1 and 2 present, fork no. 1 not very long.

Genitalia, ♂, conforming to the generic pattern but varying slightly in the proportions of the parts, more particularly in the form of the dorsal plate ; no ventral processes.

Length of the anterior wing, ♂, 16 mm.

New Zealand : Mt. Arthur, Flora River, i.1920, 1 ♂, G. V. Hudson.

Differs from *O. maori* chiefly in venation.

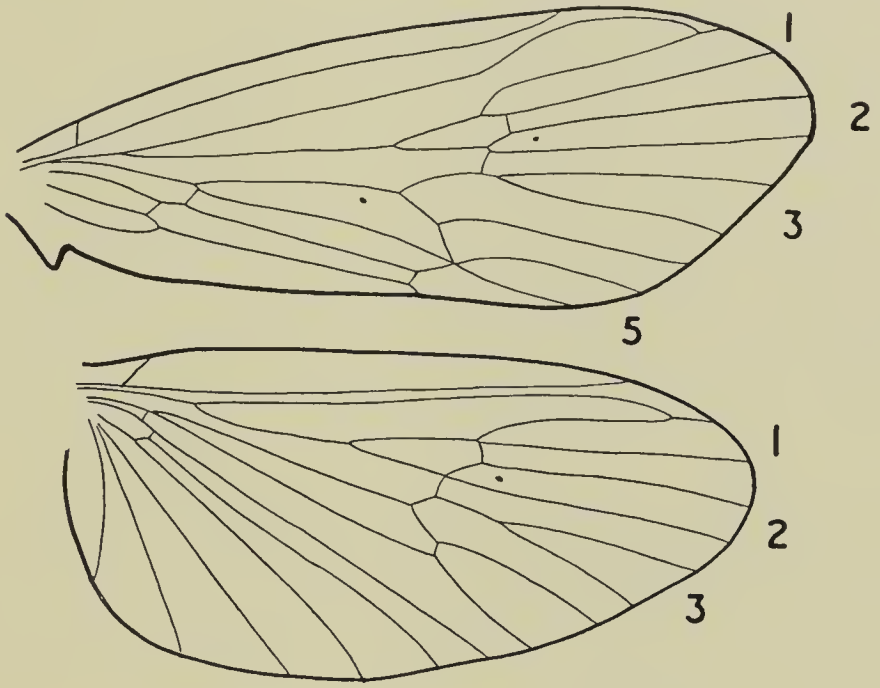

Fig. 69.—*Oeconesus* (?) sp. ♀. Wings.

Oeconesus (?) species, ♀ (fig. 69).

In the British Museum (N.H.) is a small female specimen, belonging to the group of *Oeconesus*, which may be either aberrant or may constitute the type of a new genus. In the *anterior wing* the discoidal cell is unusually small for the group, whilst in the posterior wing fork no. 5 is wanting. The length of the anterior wing is only 9 mm.

New Zealand : Wellington, Portrua, 28.x.1912, 1 ♀, G. V. Hudson.

Pseudoeconesus McLachlan.

Pseudoeconesus McLachlan, 1894, *Ent. Mon. Mag.*, (2) **5** : 239.
Pseudoeconesus Hutton, 1899, *Trans. N. Zeal. Inst.*, **31** : 236.
Pseudoeconesus Hudson, 1904, *N. Zealand Neur.* : 62.
Pseudoeconesus Ulmer, 1907, *Gen. Insect.*, **60a** : 97.

McLachlan writes of the genus :

"The species of this genus resemble *Oeconesus* in a very remarkable manner, but the neuration of the ♂ is quite different. The characters here given are mainly comparative.

"♂. Characters of antennae, palpi, legs, etc., practically the same. In the anterior wings there is no costal fold and no defined groove (present in *Oeconesus*) ; the radius is confluent with the first apical sector (in both sexes and in both pairs, as in *Oeconesus*), upper edge of the discoidal cell excised (straight in *Oeconesus*) ; apical forks Nos. 1, 2 and 3 present (irregular afterwards), the 6th apical cellule very much dilated at its base in a nearly circular manner. In the posterior wings apical forks Nos. 1, 2, 3 and 5[*] are present, and the neuration is apparently regular (but abnormally irregular on one side in the only male before me).

"♀. The joints of the labial palpi shorter and broader, the terminal joint almost spoon-shaped. In the anterior and posterior wings apical forks Nos. 1, 2, 3 and 5 [†] are present, and the neuration appears to be normal and regular."

Type species.—*Pseudoeconesus stramineus* McLachlan, 1894.

The remarks I made with regard to the generic and specific characters in *Oeconesus* apply equally to *Pseudoeconesus*. I am here taking the genitalia as affording the generic distinction, and the species are separated on their neuration, such a character as the presence even of a fold with a pencil of hairs in the posterior wing being considered merely as specific. Were any other course to be adopted, several genera would be required, all with genitalia practically the same.

The characters of the genus are as follows : *Spurs* 2, 4, 4. *Maxillary palpi* of the male broad, upturned in front of the face, single-jointed. In the *anterior wing* the costa is not folded over ; upper edge of the discoidal cell somewhat excised. Apical forks nos. 1, 2 and 3 present, irregular afterwards in ♂, nos. 1, 2, 3 and 5 in the ♀ ; the sixth apical cellule very much dilated in a circular manner at its base.

In the *posterior wing* forks nos. 1, 2 and 3 in ♂, nos. 1, 2, 3 and ? 5 in ♀. A fold containing a pencil of hairs may be present at the base of the wing in the ♂. The hairs of the posterior or of both wings in the ♂ may be normal hairs or thickened hairs which are practically scales.

Key to Species of *Pseudoeconesus*, Males.

1. Posterior wing with a pencil of hairs towards base . . . . . 2.
–. Posterior wing without a pencil of hairs . . . . . 3.
2. Apical fork no. 3 in posterior wing about as long as its footstalk *Ps. mimus* McLachlan (p. 114).
–. Fork no. 3 in posterior wing longer than its footstalk *Ps. karoriensis* sp. n. (p. 116).
3. Dorsal excision of ninth segment much wider than deep *Ps. hudsoni* sp. n. (p. 112).
–. Dorsal excision of ninth segment about as wide as deep . . . . . 4.
4. Wings clothed with thickened, clavate hair-scales *Ps. squamosus* sp. n. (p. 112).
–. Wings clothed with normal hairs . . . *Ps. stramineus* McLachlan (p. 109).

[* Fork no. 5 is absent.—D. E. K.]

[† Fork no. 5 is doubtfully present in *stramineus* and absent in *minus*.—D.E.K.]

Pseudoeconesus stramineus McLachlan (figs. 70–72).

Pseudoeeonesus stramineus McLachlan, 1894, *Ent. Mon. Mag.*, (2) 5 : 240.
Pseudoeeonesus stramineus Hutton, 1899, *Trans. N. Zeal. Inst.*, 31 : 236-237.
Pseudoeeonesus stramineus Hudson, 1904, *N. Zealand Neur.* : 63.
Pseudoeconesus stramineus Ulmer, 1907, *Gen. Insect.*, 60a : 97.

McLachlan describes the species as follows :

" ♂. Much paler than *Ps. mimus*, stramineous or pale testaceous. Anterior wings pale greyish-stramineous, closely irrorated with small whitish spots, the pubescence greyish and stramineous intermixed (no dark spots in the 3rd apical cellule), apical margin narrowly fuscescent, slightly interrupted with the ground-colour, and on the inner margin are four or five long fuscous lines alternating with long pale spaces. Posterior wings whitish-silky-stramineous, the apical portion more yellowish, fringes concolorous.

" On the ante-penultimate ventral segment is a long and strong narrow, testaceous, acute tooth, and another similar, but rather shorter, on the penultimate. Last dorsal segment concealed (in the example before me) ; superior appendages lateral, quadrate, furnished with long pale hairs. Intermediate appendages (or upper penis cover ?), viewed from above, consolidated into a broad elongate plate, canaliculate above, deeply notched at the apex, forming two obtuse apical points furnished with very long pale hairs. Inferior appendages 2-branched, the branches distant, both apparently stout and cylindrical, curved in such a manner as to leave a semicircular space between them.

" Length of body, 7 mm. Expanse of wing, 28 mm.

New Zealand, Wellington.

" ♀. As in the ♂, but the body darker, and the anterior wings with a more decided yellowish tint ; the pale and dark spaces on the inner margin less distinct.

" A sharp, broad, triangular tooth on the ante-penultimate ventral segment. Margin of the last dorsal segment nearly straight, and slightly excised in its middle. Tubular piece forming two small, broad, triangular obtuse lobes, if viewed laterally, but open above and beneath."

" Length of body, 10 mm. Expanse of wings, 33 mm.

" One example from Mount Arthur, 2800 ft., January 19th (Meyrick) ; a second much smaller example from the same locality but at 4500 ft. elevation, expands to only 20 mm."

Type, ♂, in the British Museum (N.H.).

Genitalia, ♂ (*type*).—From above, distal margin of the ninth segment widely excised, the angles produced in quadrate processes ; they are also quadrate from the side with the distal margin slightly excised ; at their bases, on the undersides, can be seen in a cleared example a pair of small superior appendages, pointed from above, rounded from the side. Upper penis-cover large, conical, apex slightly excised ; penis fleshy, with sheaths on its upper surface terminating in chitinized blunt points ; lower penis-cover broad, the sides produced in long, distally directed processes, the apices clavate and upturned. Inferior appendages with a large basal joint, stout and triangular from the side, and two sausage-shaped processes, arising side by side, at or near the base. Processes of the sixth and seventh sternites narrow, apices acute and not serrate.

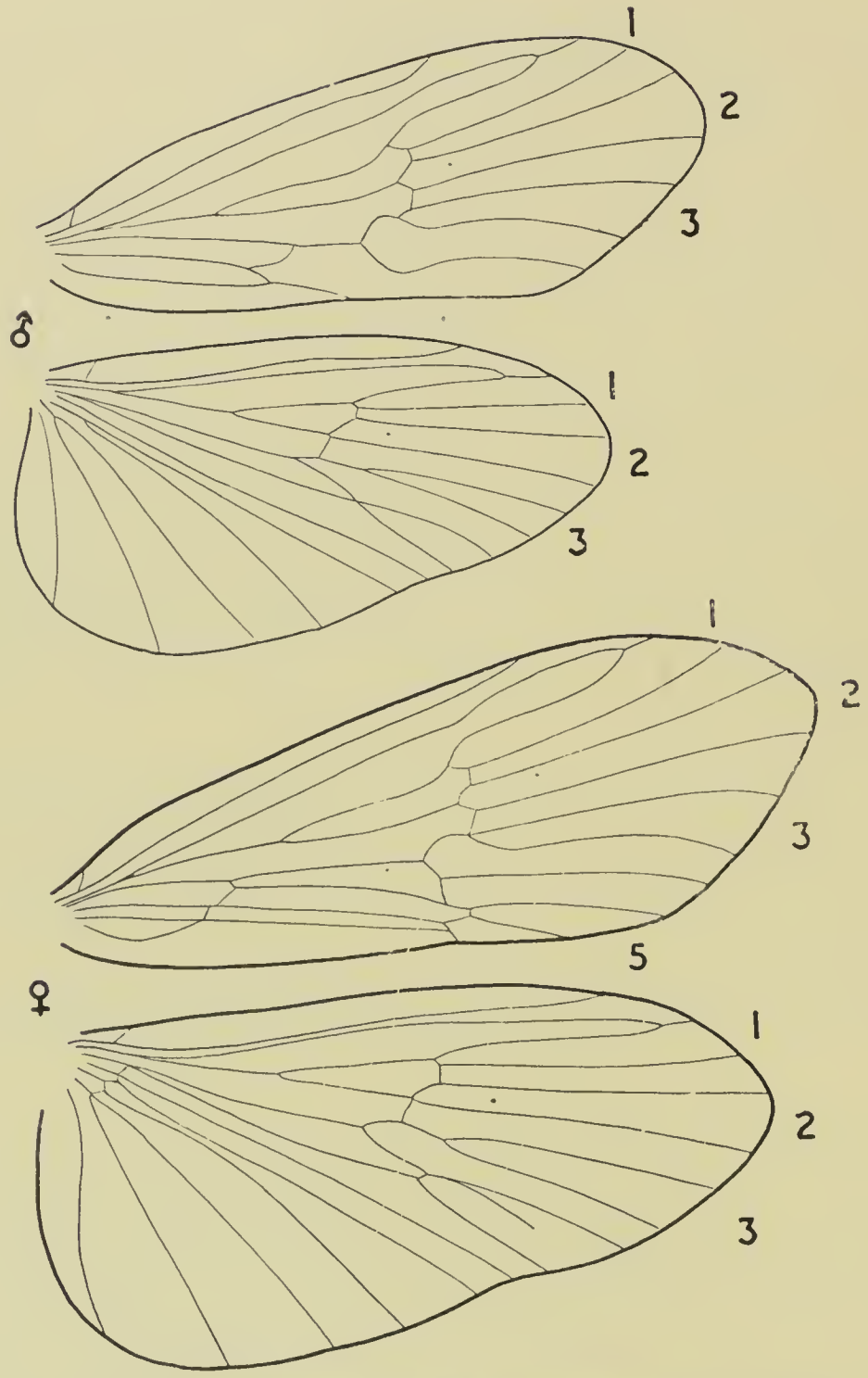

Fig. 70.—*Pseudoeconesus stramineus* McLachlan. ♂♀ wings.

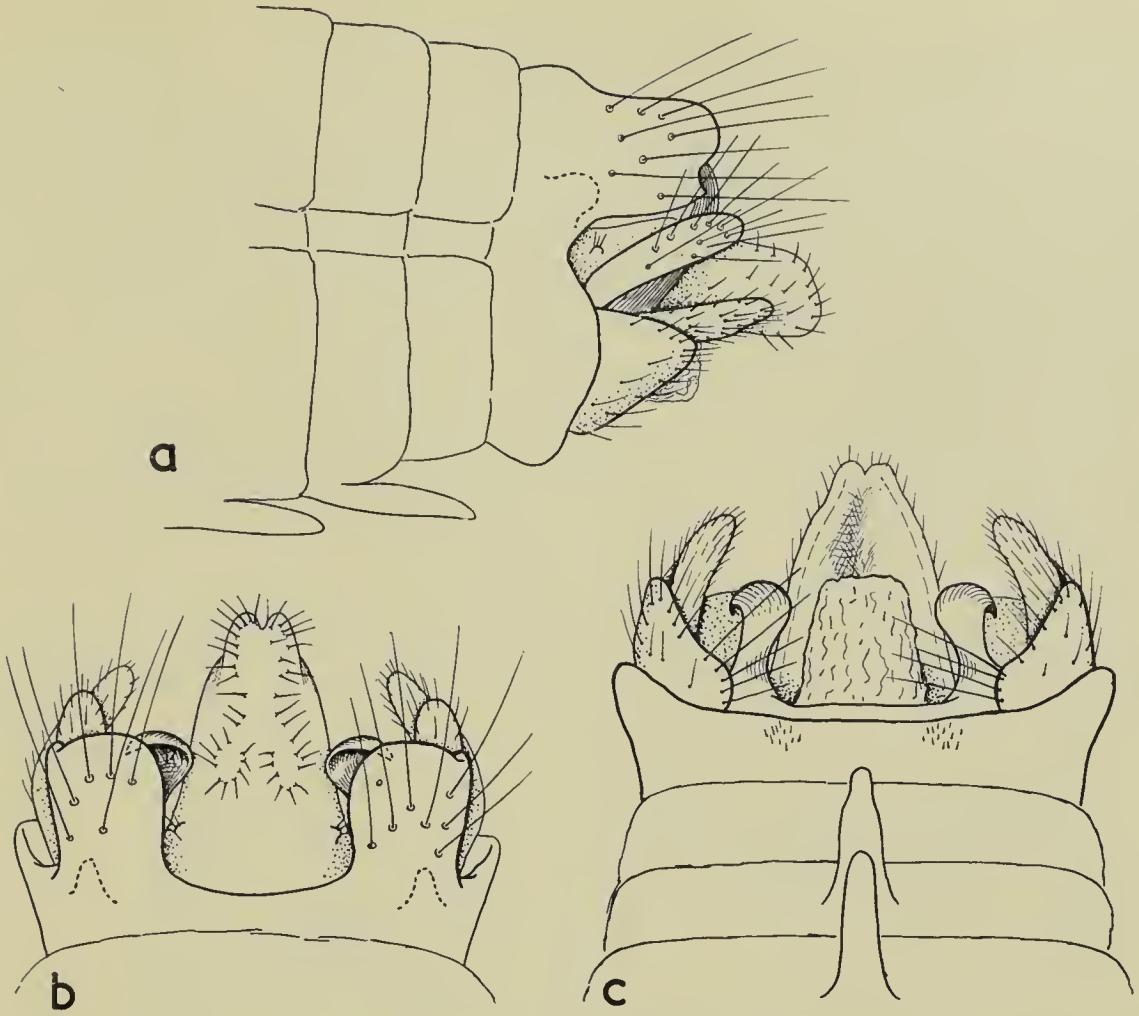

FIG. 71.—*Pseudoeconesus stramineus* McLachlan. ♂ genitalia. *a*, lateral ; *b*, dorsal ; *c*, ventral.

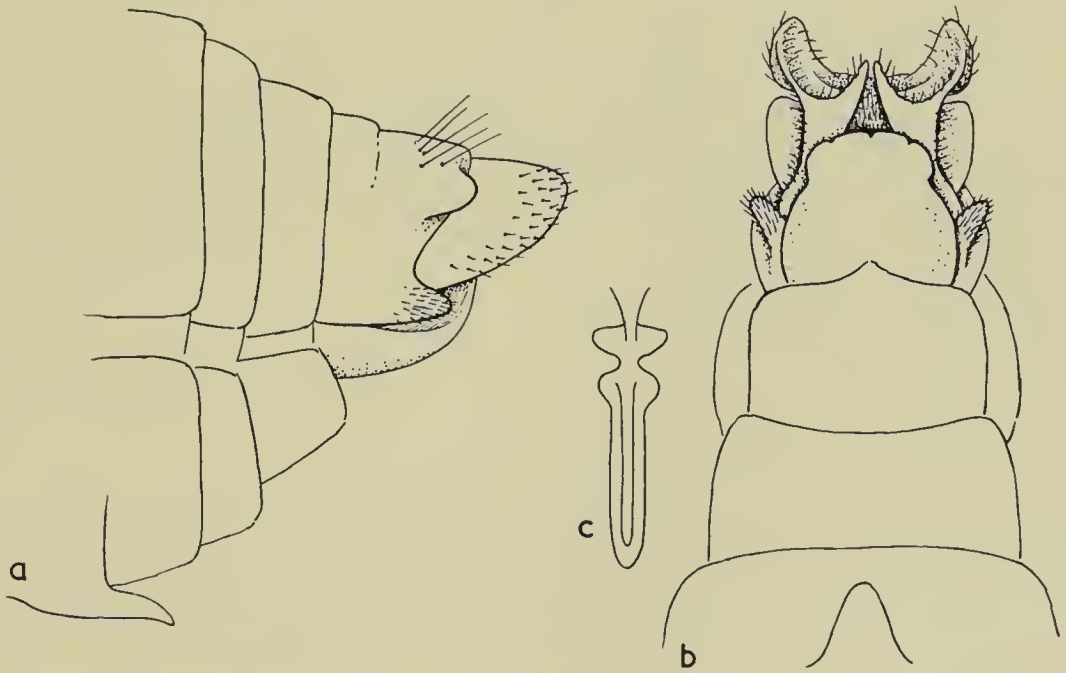

FIG. 72.—*Pseudoeconesus stramineus* McLachlan. ♀ genitalia. *a*, lateral ; *b*, ventral ; *c*, vaginal structure, ventral.

Genitalia, ♀.—From above, antipenultimate segment slightly produced at its centre so that there is a truncate centre portion, slightly excised and small, triangular projections at the angles. From the side, the segment is deep with concave distal margin and produced lower angle. From above, the terminal segment appears as a pair of outstretched lobes which, from the side, are deep and triangular ; ventral aspect as figured. A strong tooth to the sixth sternite.

Length of the anterior wing, ♂, 13 mm. ; ♀, 15·5 mm.

Hudson records :

" The perfect insect appears in January. It frequents the margins of mountain torrents."

Pseudoeconesus squamosus sp. n. (fig. 73).

Closely related to *Ps. stramineus*. General colour sandy-yellow. *Maxillary palpi* broad, covered with thickened hairs, apex subacute. Both *posterior*

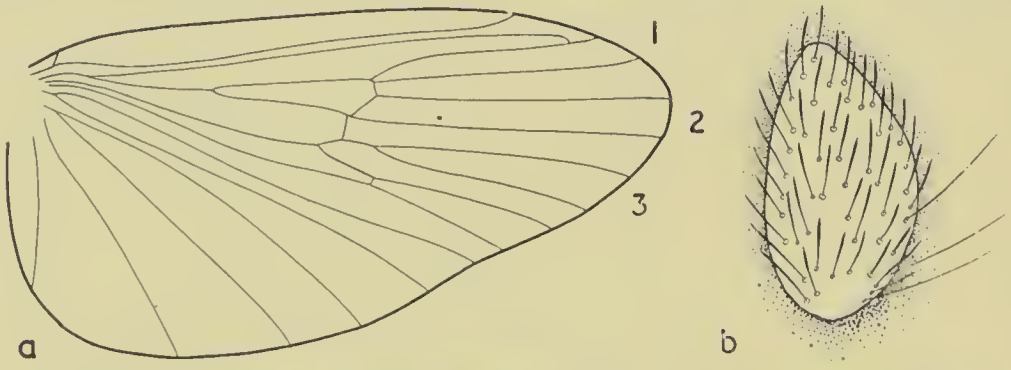

Fig. 73.—*Pseudoeconesus squamosus* sp. n. ♂. *a*, posterior wing ; *b*, maxillary palp.

and *anterior* wings covered with short, thick, clavate and erect hairs, almost amounting to scales ; they are clustered very thickly on the nervures. Neuration of the anterior wing similar to that of *stramineus* ; in the posterior, no fold or pencil of hairs at its base ; the discoidal cell is longer and narrower.

Genitalia, ♂, as in *stramineus*.

Length of anterior wing, ♂, 14 mm.

New Zealand : Wellington, 1 ♂, G. V. Hudson (*type*) ; Ta-ka-ka, 6.ii.1921, 1 ♂, R. J. Tillyard.

Pseudoeconesus hudsoni sp. n. (fig. 74).

Antennae yellowish. *Maxillary palpi* single-jointed, broad and leaf-like. *Anterior wing* light brown, closely and evenly irrorated with yellow ; *posterior wing* cream-colour, with possibly a pouch towards the base, but no pencil of hairs ; both wings bearing short hairs, somewhat thickened, but hardly to be described as scales.

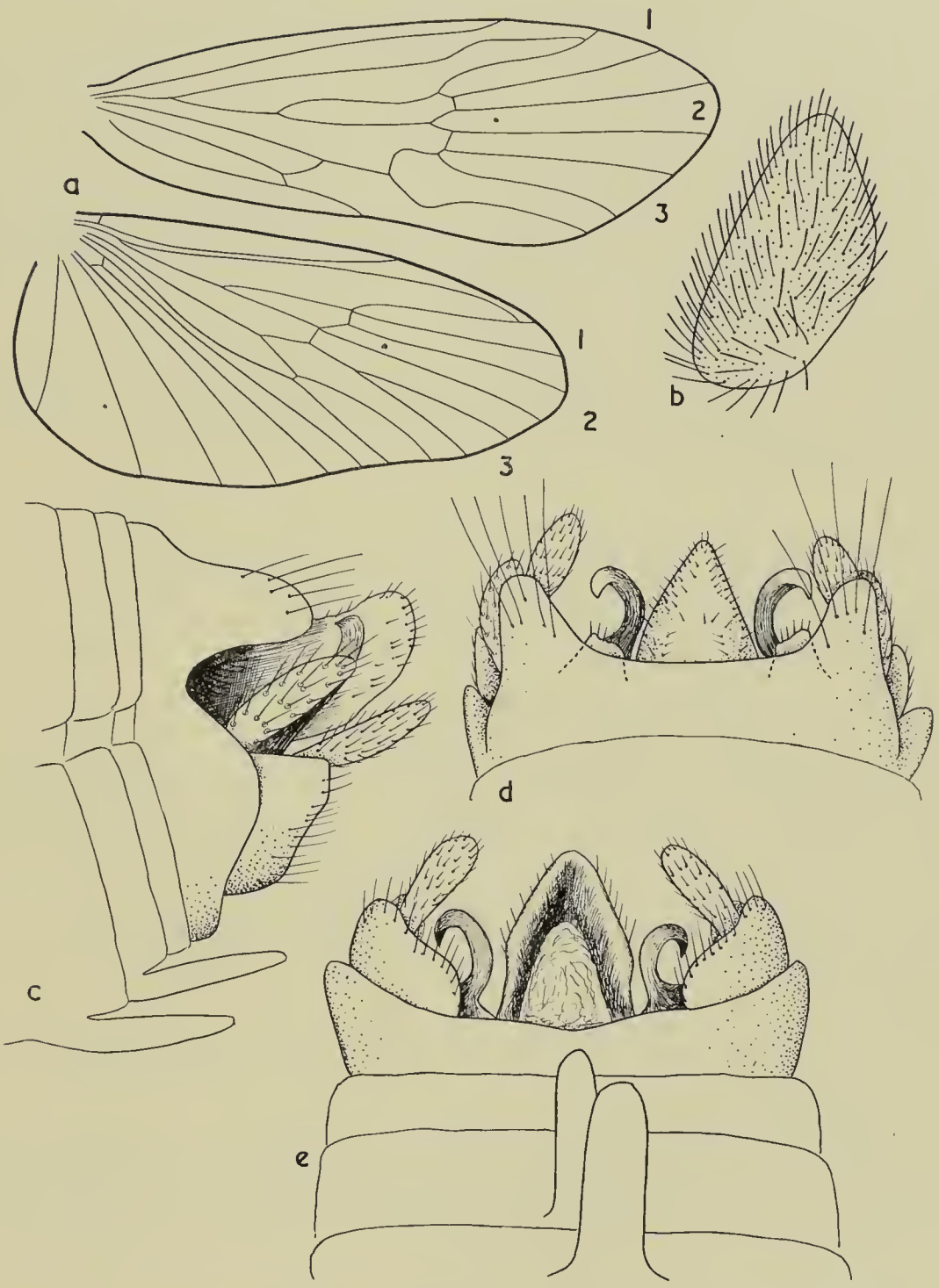

FIG. 74.—*Pseudoeconesus hudsoni* sp. n. ♂. *a*, wings ; *b*, maxillary palp ; *c*, genitalia, lateral ; *d*, dorsal ; *e*, ventral.

Genitalia, ♂.—Apical margin of the ninth dorsal segment widely excised, the sides of the excision produced to make triangular processes. From beneath, the ventral margin is also widely excised and somewhat sinuous. Beneath the produced sides of the excision are two short, broad projections, corresponding with the superior appendages(?) in *Oeconesus*, scarcely visible excepting in cleared preparations. Upper penis-cover large and conical, covered with short widely spaced hairs. Penis short and retracted. Lower penis-cover broad, with the sides produced in long, curved structures, apices clavate and divergent. Inferior appendages with the basal joint large and triangular, the two terminal processes membranous with dilated apices, inserted one behind the other on its inner surface. Very long and stout processes to the sixth and seventh ventral segments.

Length of anterior wing, ♂, 13 mm.

New Zealand : Karori Reservoir Reserve, 19.i.1936, 1 ♂, G. V. Hudson.

The form of the dorsal excision of the ninth segment separates this species from *Ps. squamosus* and *Ps. stramineus*.

Pseudoeconesus mimus McLachlan (figs. 75, 76).

Pseudoeconesus mimus McLachlan, 1894, *Ent. Mon. Mag.*, (2) 5 : 239–240.
Pseudoeconesus mimus Hutton, 1899, *Trans. N. Zeal. Inst.*, 31 : 236.
Pseudoeconesus mimus Hudson, 1904, *N. Zealand Neur.* : 63, pl. 10, fig. 10.
Pseudoeconesus mimus Ulmer, 1907, *Gen. Insect.*, 60a : 97.

McLachlan describes the species as follows :

" ♀. Almost precisely similar to the same sex in *Oe. maori*, but slightly smaller. In the anterior wings the excised upper edge of the discoidal cell (mentioned in the generic characters) is a good structural definition ; the pale irrorations are larger and less regular (more as in the ♂ of *Oe. maori*) ; near the base of the 3rd apical cellule is a rather large rounded pale spot, on each side of which is a somewhat conspicuous brown spot (wanting in *Oe. maori*).

" On the ante-penultimate ventral segment is a very strong triangular tooth. End of abdomen very similar (in dried examples) to that of *Oe. maori*.

New Zealand : Wellington. 2 females."

Genitalia, ♂.—The genitalia of a ♂ example in the McLachlan Collection shows no appreciable difference from that of *P. karoriensis* and is consequently not figured here.

Genitalia, ♀.—Last segment terminates in two lobes, rounded from the side : the penultimate segment, from the side, is seen cutting across these lobes and bearing on its lower margin a large wart ; ventrally, the segment terminates in an irregularly rounded plate separated from the tergite by a deep excision as seen from the side. There is a strong tooth to the sixth (or seventh ?) sternite.

Length of the anterior wing ♀ 14 mm.

Hudson records :

" The perfect insect appears in November, and frequents streams running through dense forests."

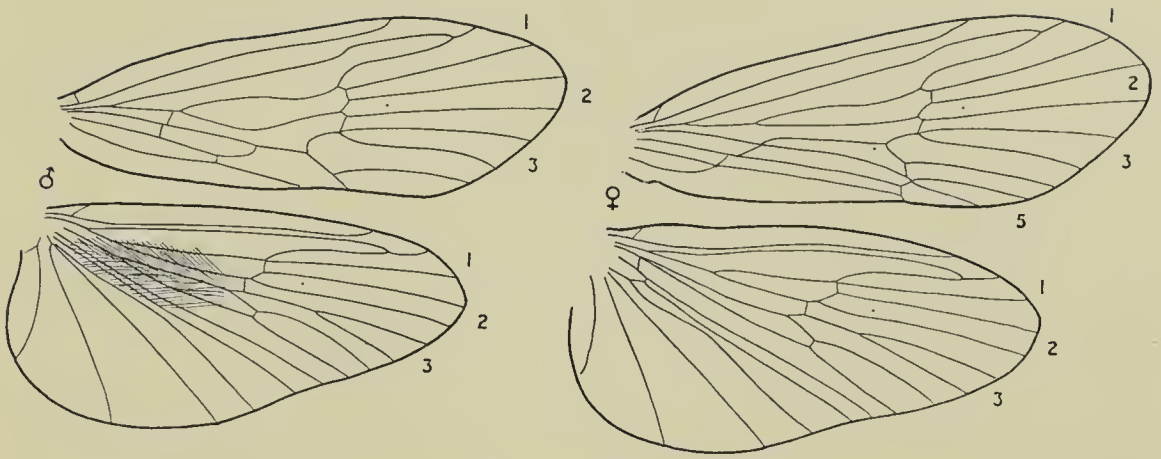

Fig. 75.—*Pseudoeconesus mimus* McLachlan. ♂♀ wings.

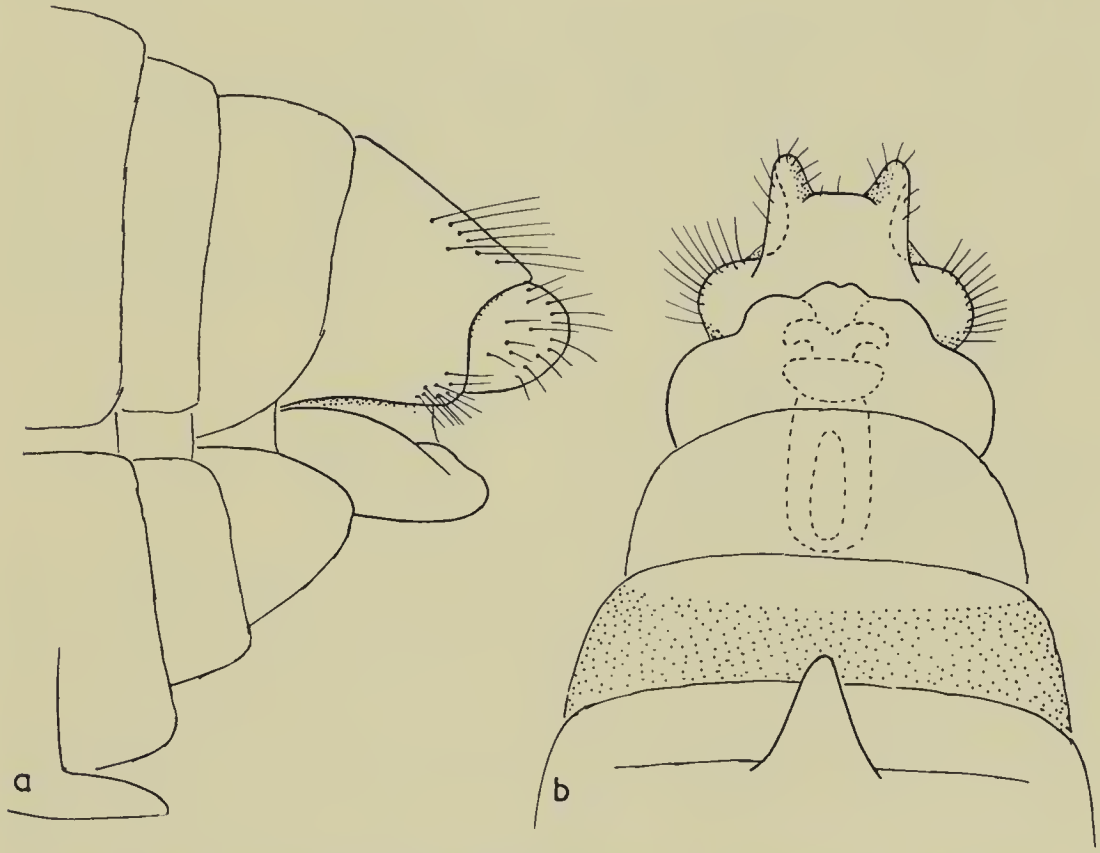

Fig. 76.—*Pseudoeconesus mimus* McLachlan. ♀ genitalia. *a*, lateral ; *b*, ventral.

Pseudoeconesus karoriensis sp. n. (fig. 77).

Colour stramineous. *Maxillary palp*, ♂, probably single-jointed, flat, upturned, its convex outer surface covered with short, thickened hairs, apex rounded. *Anterior wing*, ♂, conforming in its neuration to that given by McLachlan in his generic description, but in the *posterior wing* there is a deep fold bearing a pencil of pale yellow hairs, extending from the base to the anastomosis and passing through the centre of the wing.

Genitalia, ♂.—Apical margin of the ninth dorsal segment straight with a pair of large, triangular projections at the apical angles: from the side, the apices of these projections are long and produced downward and tailward. Upper penis-cover conical, covered with short, widely-spaced hairs; from the side, with a wide, rounded excision along its upper margin. Penis fleshy, with strongly chitinized side-plates terminating in minute hooks; these may possibly be penis-sheaths. Lower penis-cover(?) broad, with the sides produced in long, curved structures; apices clavate, slightly hooked and divergent. Inferior appendages with the basal joint large and triangular, the two terminal processes membranous as in *hudsoni*, but with the upper branch shorter and broader than in this species; very long and stout processes to the sixth and seventh ventral segments, with the apices broadly truncate and serrate.

Length of anterior wing, ♂, 14 mm.

New Zealand: Karori, 6.xi.1912, 1 ♂ (*type*); Wainuiomata, 12.ii.1921, 1 ♂ G. V. Hudson; New Zealand. Hudson, 1 ♂ (Collection G. Ulmer).

Since describing *karoriensis* the British Museum (N.H.) has obtained an example of *Ps. mimus*, ♂, labelled as such by McLachlan. The neuration of this example differs slightly from that of *karoriensis* but the genitalia seem to coincide. There is no direct evidence that the McLachlan ♂ of *mimus* is correctly associated with the ♀ type. In the circumstances I prefer to keep the species distinct.

Zelandopsyche Tillyard.

Zelandopsyche Tillyard, 1921, *Trans. N. Zeal. Inst.*, 53: 348–349.

Tillyard describes the genus as follows:

"Allied to *Oeconesus* McL. and to *Pseudoeconesus* McL., but more especially to the latter, the forewings having neither costal fold nor a well-defined groove. Spurs 2, 4, 4; the two sets on the middle and hind tibiae close together. In the male the maxillary palps are three-jointed and raised upwards, so as to lie close against the face; the first two joints are very short, cylindrical, the third very long, its basal two-thirds being fusiform, its apical third much narrower and cylindrical; the swollen basal portion carries some long soft hairs, the apical portion more numerous but much shorter ones. Antennae slightly longer than forewing in male, the basal joint thickened, as long as the next three taken together. Wing-venation differing considerably in the two sexes. In the female the neuration is fairly normal; but R_1 ends up on R_2 instead of on the wing-margin, and the fork of Cu_1 is abnormal, in so far as Cu_{1b} is in the form of a cross-vein, and fuses with Cu_2 not far from its apex. The discoidal or radial cell is closed, the median cell open. From the thyridium, M_{3+4} runs obliquely downwards as a straight line to connect with Cu by a very short

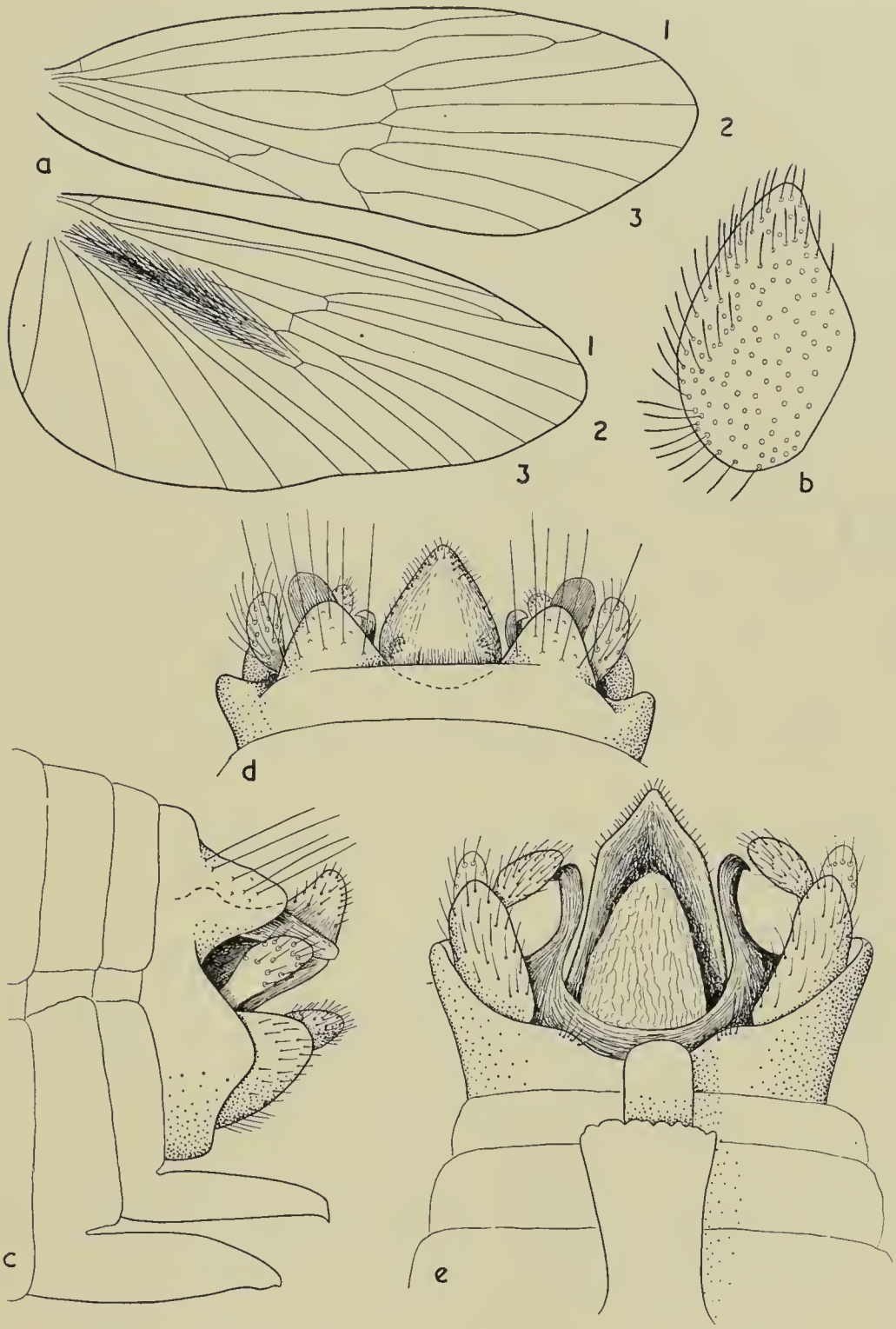

FIG. 77.—*Pseudoeconesus karoriensis* sp. n. ♂. *a*, wings; *b*, maxillary palp; *c*, genitalia, lateral; *d*, dorsal; *e*, ventral, dorsal plate and superior appendages omitted.

cross-vein at the point of origin of Cu_{1b}, which continues this line downward with a backward bend. Near the base, M, Cu and 1A are all fused together; 2A and 3A junction with 1A after it has left M and Cu, which continue fused for a further short distance. In the forewing of the male the venation is similar to that of the female from the costa down to M_2, except that the discoidal cell is much larger, Rs bifurcating very close to the base. Below this there is an area of high specialization, in which the thyridium and that portion of the main stem of M lying basad to it appear to have become completely fused with Cu_1, and also with Cu_2. M_{3+4} is unbranched, and leaves the cubitus distally in such a manner as to suggest a normal cubital fork. The anal venation is also abnormal and cannot be interpreted with certainty. The hindwings of both sexes are closely similar, [*] with fairly normal venation; the discoidal cell is closed, the median cell open, and apical forks 1, 2, 3 and 5 all present.

" Genotype : *Zelandopsyche ingens* Tillyard.

" This genus differs from *Pseudoeconesus* and *Oeconesus* in the much larger size and the form of the maxillary palpi of the male; in the two genera mentioned the third joint is much swollen and of an oval shape. It also differs from both genera in the peculiar specialization mentioned in the male venation in the region of the thyridium of the forewing. It differs further from *Pseudoeconesus* in having R_{2+3} forming the anterior border of the discoidal cell, straight, and from *Oeconesus* in lacking the costal fold and definite groove in the forewing.

" The three genera *Oeconesus*, *Pseudoeconesus* and *Zelandopsyche* appear to me to be so distinct from the rest of the family that they might legitimately be placed together in a single tribe *Oeconesini*, distinguished by their broadly rounded forewings and general Limnephilid appearance. Representatives of this tribe occur very rarely also in Australia and Tasmania, but have not yet been described."

[I have seen no examples of the *Oeconesini* from Australia or Tasmania in any of the collections in the British Museum (N.H.).—M. E. M.]

Zelandopsyche ingens Tillyard (figs. 78–80).

Zelandopsyche ingens Tillyard, 1921, *Trans. N. Zeal. Inst.*, **53** : 349–350.

" ♂. Total length, 12·7 mm.; abdomen, 8·2 mm.; forewing, 19 mm., hindwing, 16 mm.; expanse of wings, 38·5 mm.; antennae, 21·5 mm.

" *Head* rich brown; eyes black; antennae brown, the articulations of the joints beyond the scape only faintly indicated. Maxillary palps as described for the genus, dark brown. Labial palps pale brown, slender, the basal joint shortest, the second and third about equal; viewed from below, the second joint is ridged along both edges, and carries short hairs. Fig. 78 shows the two pairs of palps and the base of the antennae *in situ*, as seen somewhat ventrally from in front.

" *Thorax* dark brown; prothorax very short, mesothorax large and stoutly built, metathorax rather short. Legs pale brown, very long, the length of the hindleg when extended being about 21 mm.; the tibial spurs as in the generic definition. Forewings dull fuscous-brown, costal margin paler brown; hairs very short, the venation clearly visible; apical half of the wing irrorated irregularly with small paler-brown areas, especially along the anastomosis and for 3 mm. to 4 mm. inside the apical margin. Hindwings of a paler brown, costal margin and distal end of Sc

[* In the posterior wing of the ♂ only apical forks nos. 1, 2 and 3 are present in an example from Arthur's Pass, presented by Mr. G. V. Hudson to the British Museum (N.H.).—D. E. K.]

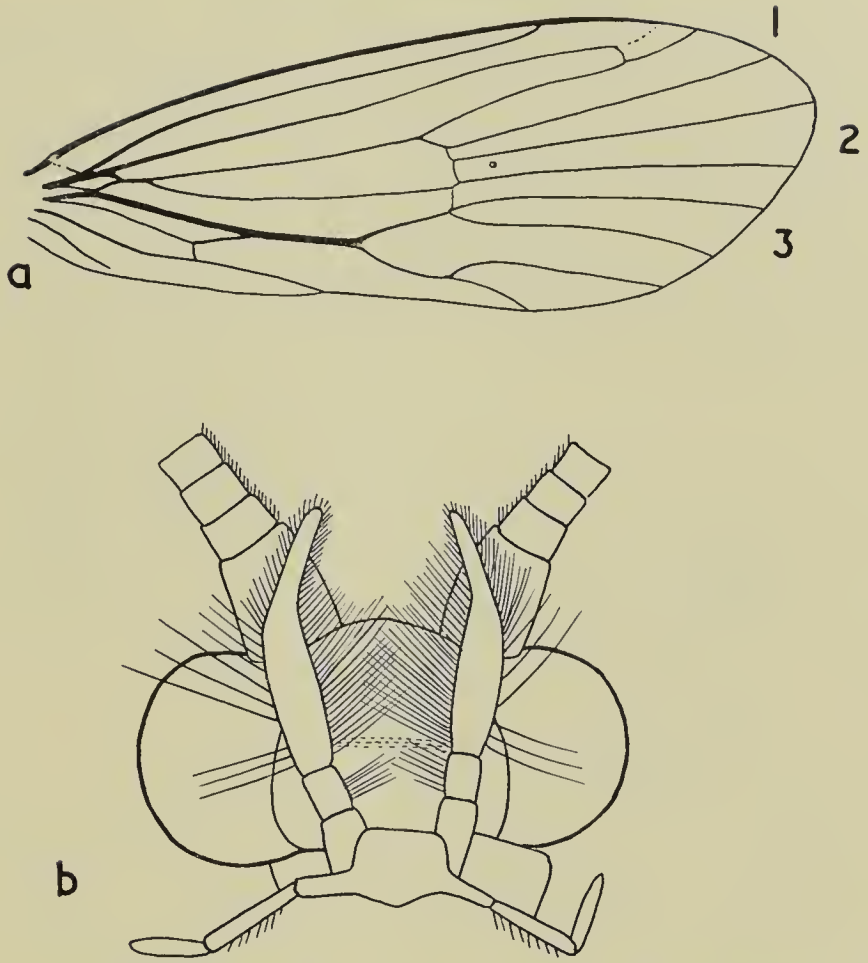

Fig. 78.—*Zelandopsyche ingens* Tillyard. ♂. *a*, anterior wing; *b*, head (after Tillyard).

Fig. 79.—*Zelandopsyche ingens* Tillyard. ♂ genitalia. *a*, lateral; *b*, dorsal; *c*, ventral (after Tillyard).

yellowish-brown ; hairs exceedingly short, except at the base of anal veins and along anal border, where very long pale-yellowish hairs are abundant. Venation as given in the generic definition : that of the forewing male is shown in fig. 78*a*.

" *Abdomen* dull greyish-brown, the first segment slightly paler. Appendages rich brown, shaped as shown in fig. 79.

" Female very similar to male but larger. Forewings paler, with a large subquadrangular blotch of pale yellowish-brown between Cu and 1A about two-fifths from the base ; the paler irrorations are more definite, and tend to become arranged in transverse rows across the distal half of the wing. Maxillary palps with joints 1–2 short, 3–5 long and about equal. Abdomen stouter and longer than in the

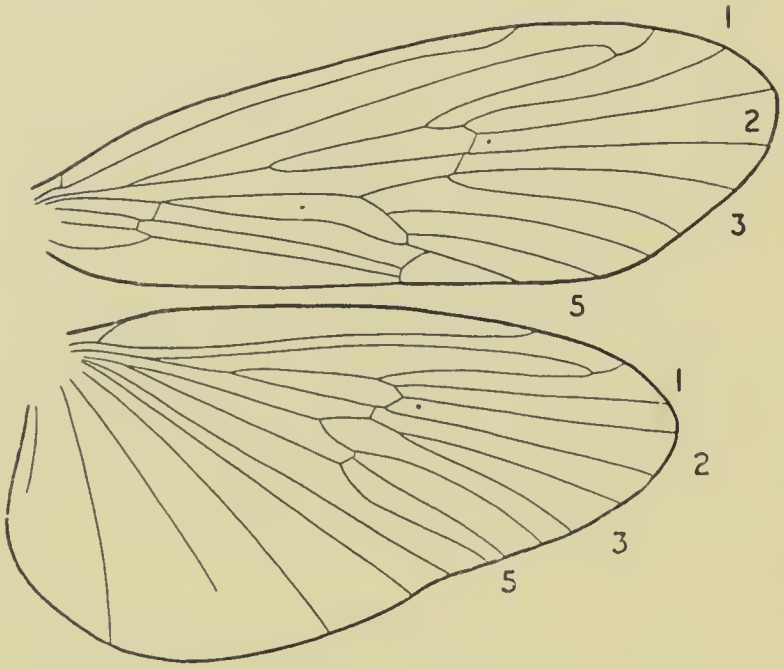

Fig. 80.—*Zelandopsyche ingens* Tillyard. ♀ wings.

male, the terminal portion (somewhat shrivelled) apparently carrying downward lateral flaps on segments 8–9.

" *Types.*—Holotype, ♂, and allotype, ♀, in Mr. G. V. Hudson's collection.

" *Habitat.*—Taken amongst stones at the water's edge, Routeburn Valley, near Lake Wakatipu."

I add this supplementary description of the ♂ and ♀ genitalia taken from dried examples.

Genitalia, ♂.—From above, ninth segment is produced in two nearly quadrate lobes, divided from each other by a narrow excision ; beneath these is a furcate upper penis-cover with a long, narrow, superimposed plate broadening at the apex. Inferior appendages with large basal joints from each of which arises a pair of terminal joints, sausage-shaped and more or less side by side.

Genitalia, ♀.—From above, the abdomen terminates in an elongate triangle below which is the tubular piece, cleft from above, broadly and bluntly triangular from the side.

The British Museum (N.H.) has examples from Mt. Arthur (Arthur's Pass), Canterbury (Mt. Turlessi) and Gouland Downs.

The perfect insect appears in January and February. Tillyard writes of its larva that it " constructs a huge, cylindrical case made of small pieces of twigs of *Nothofagus* placed transversely and very neatly sewn together."

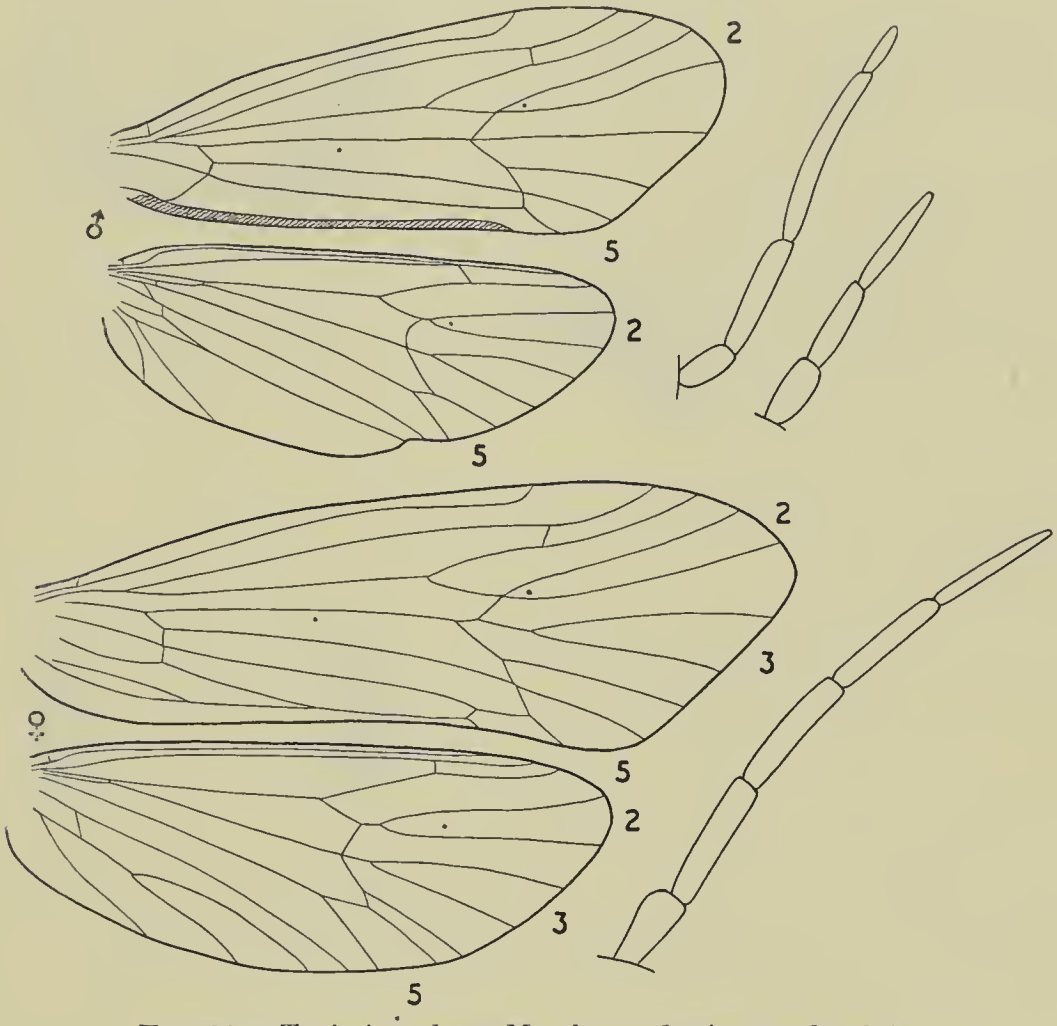

Fig. 81.—*Tasimia palpata* Mosely. ♂♀ wings and palpi.

Tasimia Mosely.

Tasimia Mosely, 1936, *Proc. Zool. Soc. Lond.*, 1936 : 404.

The characters of this aberrant genus, which (in spite of the four-jointed male maxillary palpi) I believe to belong to the *Sericostomatidae*, are as follows :

Ocelli absent. *Spurs* 2, 4, 4, one spur of anterior tibia much smaller than the other. *Maxillary palpi* male, four-jointed ; basal joint small, second nearly twice as long, third as long as the first and second together, fourth slightly shorter than the first. Labial palpi, second joint longer than the first and shorter than the third. Female, maxillary palpi five-jointed as usual ;

basal joint short, dilated at its apex, second about twice the length of the first, third, fourth and fifth about equal in length, each slightly shorter than the second. *Antennae :* Basal joint bulbose, second shorter and broader than the succeeding joints. *Anterior wing* : male with forks nos. 2 and 5 present, the lower margin of the wing rolled over in a narrow fold on the post-costa ; female,

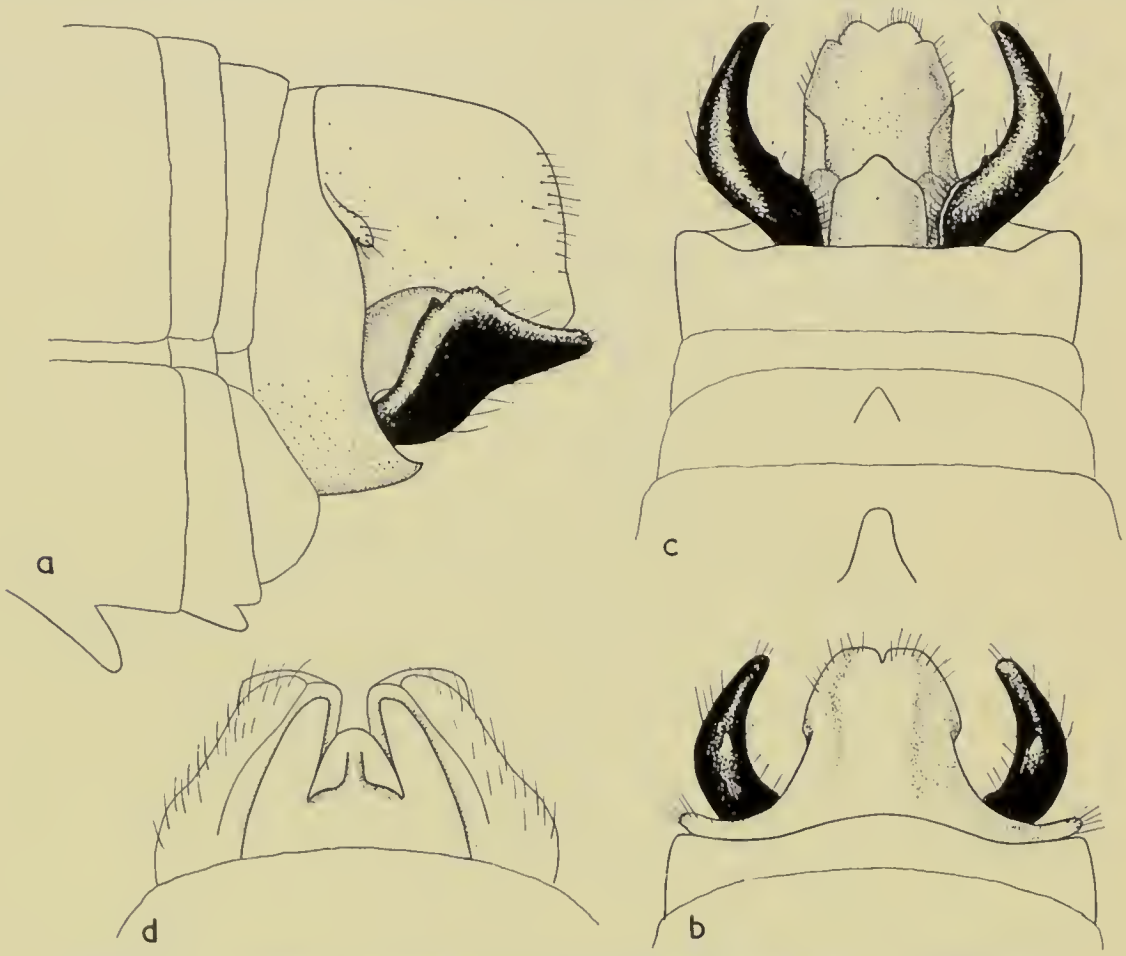

Fig. 82.—*Tasimia palpata* Mosely. *a*, ♂ genitalia, lateral ; *b*, dorsal ; *c*, ventral ; *d*, ♀ genitalia, ventral.

with forks nos. 2, 3 and 5. *Posterior wing*, forks nos. 2 and 5 in the male, nos. 2, 3 and 5 in the female ; there is an excision in the lower margin of the male posterior wing but not in the female. *Genitalia* male, very simple in construction, there being, besides a short, retracted penis, merely a large dorsal hood and short inferior appendages ; two ventral processes to the male and one to the female.

Type species.—*Tasimia palpata* Mosely, 1936.

Key to Species of *Tasimia*, Males.

1. Inferior appendages from side bluntly humped on upper margin . . . . 2.
–. Inferior appendages from side acutely produced on upper margin
T. natasia sp. n. (p. 123).

2. Fourth apical cellule in posterior wing with short footstalk
T. palpata Mosely (p. 123).
–. Fourth apical cellule in posterior wing a little longer than its footstalk
T. serrata sp. n. (p. 123).

Tasimia palpata Mosely (figs. 81–82).

Tasimia palpata Mosely, 1936, *Proc. Zool. Soc. Lond.*, **1936** : 405–406, figs. 22–29.

Head fuscous with light fuscous hairs ; oculi black ; *antennae* fuscous ; *legs* pale fuscous ; *wings* fuscous, anterior very faintly irrorated with pale, round spots ; neuration distinct. Other characters detailed in the generic description.

Genitalia, ♂.—Apical margin of the ninth tergite straight ; beyond it there proceeds a large hood, broad at the base, with each basal angle produced in a very small, narrow wart, apex excised ; no superior appendages, nor, so far as may be seen, upper penis-cover. Penis short and concealed. Inferior appendages large, black ; from above and beneath, calliper-shaped, with an angular projection on each upper surface about midway ; from the side, it resembles the butt of a gun ; a small ventral process to the seventh and a larger to the sixth sternite.

Genitalia, ♀.—From above, the abdomen terminates in two rounded lobes with a deep excision between ; from beneath, there is a distinct vulvar scale, inner lobe very broad and shorter than the two outer lobes ; a short process to the antepenultimate sternite.

Length of the anterior wing, ♂, 7 mm.; ♀, 8 mm.

Tasmania : Launceston, Cataract Gorge, i. 1923, 1 ♂, 1 ♀ (*types*), C. L. Edwards ; Tasman Pt., xii. 1940, 1 ♂, J. W. Evans.

Tasimia natasia sp. n. (fig. 83).

Insect yellowish. *Maxillary palpi* with basal joint short ; second joint long, rather more than twice the length of the first ; third very long, as long as the first and second together, membranous ; fourth a little longer than the first ; labial palpi, first joint slightly shorter than each of the second and third, which are approximately equal.

Genitalia, ♂.—From above, ninth segment produced in a large, oblong plate, forming a hood with the distal margin cleft when viewed from behind. From the side, distal margin truncate. The plate is produced laterally at the base on each side to form a wart, which is very narrow from the side. Upper penis-cover, if present, obscure. Penis with a large, rectangular apex arising from a somewhat narrow stem. Lower penis-cover closely pressed to the penis with the centre of its margin produced in a small, downturned hook. Inferior appendages dark, from the side with a wide, irregularly concave distal margin, each angle produced in a strong claw of which the lower is the longer. The inner surfaces are rugose towards the base. A small process to the sixth sternite and a still smaller one to the seventh.

Length of the anterior wing, ♂, 5 mm.

FIG. 83.—*Tasimia natasia* sp. n. ♂. *a*, wings; *b*, palpi; *c*, genitalia, lateral; *d*, penis, lateral; *e*, genitalia, dorsal; *f*, ventral.

Australia : New South Wales, Stanwell Park, 15.iv.1936, 1 ♂, R. J. Tillyard, mounted in balsam.

The species closely resembles *Tasimia palpata*, from Tasmania, but differs in the proportions of the maxillary palpi, and in the form of the inferior appendage, which has a noticeably more produced and acute claw on the upper margin.

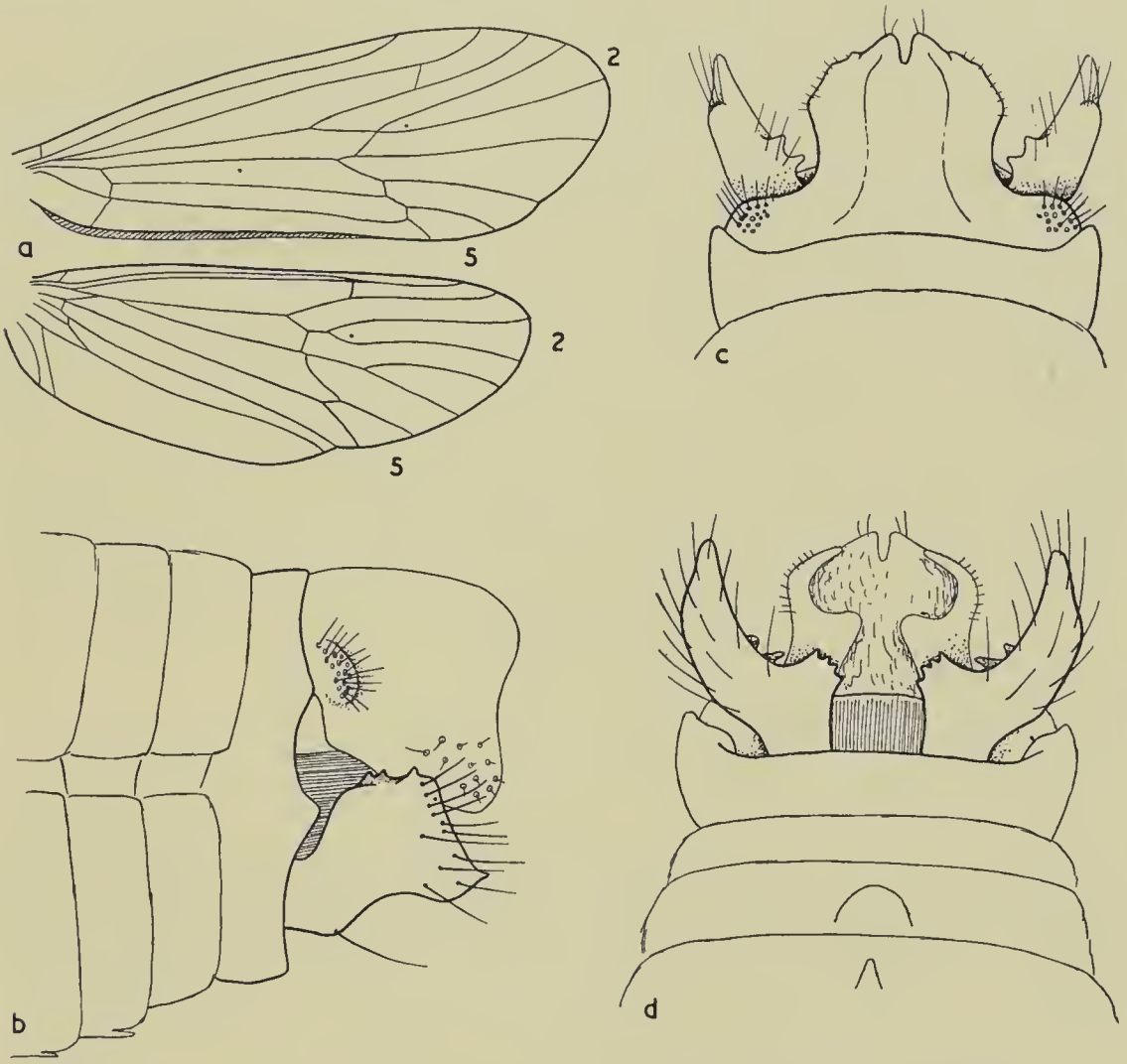

Fig. 84.—*Tasimia serrata* sp. n. ♂. *a*, wings ; *b*, genitalia, lateral ; *c*, dorsal ; *d*, ventral.

Tasimia serrata sp. n. (Kimmins) (fig. 84).

♂. Insect brownish ; *anterior wing* with numerous paler irrorations. *Antennae* brownish, without annulations. *Maxillary palpi* clothed with dark brown hairs ; labial palpi paler, with golden hairs. Neuration conforming to the generic pattern. In the *posterior wing* the fourth apical cellule has a longer footstalk than in the type species or *T. natasia* Mosely.

Genitalia, ♂.—Ninth tergite produced in a large and deep hood arising from a broad base ; from above with a narrow excision in the centre of its apical margin. From the side, the apex of the hood is very shallowly excised, and on each side of the widened base is a rounded, hairy wart. From below, the lower margins of the hood are turned inwards in a pair of triangular plates. Penis with a dilated and truncate apex, arising from a narrow stem. No visible lower penis-cover. Inferior appendages from the side resembling those of *T. palpata* but with a shorter apex ; upper margin with several small teeth about mid-way. From beneath the appendages are somewhat sinuous and divergent, apices subacute ; inner margin before the middle produced to form a serrate lobe. Beyond the middle the inner surface bears one or two acute teeth. Margin of the ninth sternite almost straight. A broad rounded process to the seventh sternite, and a smaller pointed one to the sixth segment ; from the side, both processes are closely adpressed to the segments.

Length of anterior wing, 5·5 mm.

AUSTRALIA : New South Wales, Mt. Kosciusko, 24.xi.1921, 2 ♂, R. J. Tillyard.

Type with one pair of wings denuded and the abdomen mounted in canada balsam.

This species is closely related to *T. palpata* and *T. natasia*, but may be separated from them by the relatively longer footstalk to the fourth apical cellule in the posterior wing, and by the form of the inferior appendages.

Olinga McLachlan.

Olinx McLachlan, 1868, *Journ. Linn. Soc. Lond. Zool.*, **10** : 196–198.
Olinga McLachlan, 1894, *Ent. Mon. Mag.*, (2) **5** : 240.
Olinga Ulmer, 1907, *Gen. Insect.*, **60a** : 97–98.

McLachlan describes the species as follows :

" *Head—antennae* slightly shorter than the wings, stout ; the basal joint very long and thick, fringed beneath with long and strong hairs ; *vertex* small, with very long hairs at the sides turned inwards : *maxillary palpi* apparently two-jointed, curved over the face, short and subcylindrical ; the apex furnished with a tuft of very long hairs, which extend to the middle of the basal joint of the antennae : *labial palpi* long ; the basal joint elongato-triangular, the second and third slender, long and nearly equal : *eyes* prominent, subglobose.

" *Thorax—prothorax* hidden, provided with long hairs ; *meso-* and *metathorax* scarcely hairy, shining ; the former long, narrowed posteriorly, with a broad concave space in the middle above ; the metathorax is much narrower, also with a concave median space, in the centre of the posterior portion of which is a triangular meta-scutellum.

" *Legs* moderately long and slender, pubescent, the tibiae with also stronger and spine-like hairs mixed with the pubescence ; *tarsi* long ; *spurs* 2, 4, 4, furnished with spine-like, closely adpressed hairs, similar to those on the tibia itself ; the two pairs on the posterior tibiae are very long, and placed near together, the subapical pair being situated at about five-sixths of the distance from the base.

" *Wings* *anterior wings* narrow at the base, the apex widely dilated, the apical

margin oblique ; costa at the base provided with an inturned lobe, which is fringed with strong hairs ; a small obtuse lobe at the base of the dorsal margin ; fringes very short ; the whole of the membrane is thickly clothed with scales (very short inflated hairs) above, least dense at the base and apex ; parallel with the apical margin, but at some distance from it, is an impressed furrow in which the scales are very dense ; near the anal angle this furrow meets a longitudinal pouch, extending somewhat obliquely along the dorsal margin, and running into the base of the wing ; neuration indistinct ; subcosta straight ; radius parallel with the subcosta, and appearing to end in a fork on the costa (but this fork is somewhat uncertain) ; the two branches of the ramus discoidalis ending in long forks, the upper one connected with the radius by a transverse veinlet ; discoidal cell small, closed ; a transverse veinlet connects the lower fork with the upper branch of the ramus thyrifer ; this latter appears to end in two forks ; the lower branch long and simple ; the ramus clavalis and cubital veins are concealed in the pouched fold ; *posterior wings* shorter than the anterior, obtusely rounded at the apex, broad, the dorsal margin towards the base with a very long fringe ; the membrane is without scales, but is rather thickly clothed with procumbent hairs ; subcosta and radius scarcely separated : ramus discoidalis ending in two long forks ; the upper branch connected with the radius by a transverse veinlet ; discoidal cell somewhat similar to that in the anterior wings ; an oblique transverse veinlet uniting its lower edge with the ramus subdiscoidalis, which ends in a long fork ; the first costula ends in a fork, the others are simple.

"*Abdomen* short and slender ; a forked lobe proceeds from the middle of the last segment above : the penultimate segment is furnished beneath with a broad and obtuse lobe extending beyond the apex ; appendices complicated."

Type species.—*Olinx feredayi* McLachlan, 1868.

Olinga feredayi (McLachlan) (figs. 85, 86).

Olinx feredayi McLachlan, 1868, *Journ. Linn. Soc. Lond. Zool.*, **10** : 198–199, 211, pl. 2, fig. 2.
Olinx feredayi McLachlan, 1873, *Ann. Mag. N. H.*, (4) **12** : 39.
Olinga feredayi McLachlan, 1894, *Ent. Mon. Mag.*, (2) **5** : 240.
Olinga feredayi Hutton, 1899, *Trans. N. Zeal. Inst.*, **31** : 238.
Olinga feredayi Hudson, 1904, *N. Zealand Neur.* : 65–67, pl. 9, figs. 1–4.
Olinga feredayi Ulmer, 1907, *Gen. Insect.*, **60a** : 97–98, pl. 12, fig. 104.

McLachlan describes the species as follows :

" *Head*—antennae yellow, each joint (except the basal) slightly fuscescent and thickened at its apex ; basal joint beneath with a fringe of strong hairs ; from each side of the *vertex*, near the margin of the eyes, proceeds a fringe of long, inturned, silky, pale-ochreous hairs, forming a tuft between the basal joints of the antennae ; tuft of the *maxillary palpi* also pale ochreous ; *labial palpi* of the same colour ; *eyes* fuscous.

" *Thorax*—*prothorax* clothed with long pale-ochreous hairs ; *meso-* and *metathorax* shining pale castaneous.

" *Legs* pale yellowish-ochreous, clothed with like-coloured pubescence ; on the anterior tibiae and tarsi, and intermediate tibiae, are adpressed blackish spine-like hairs, which also clothe the spurs on these tibiae ; the spurs on the posterior tibiae are only slightly covered with the ordinary pale and procumbent pubescence ; all

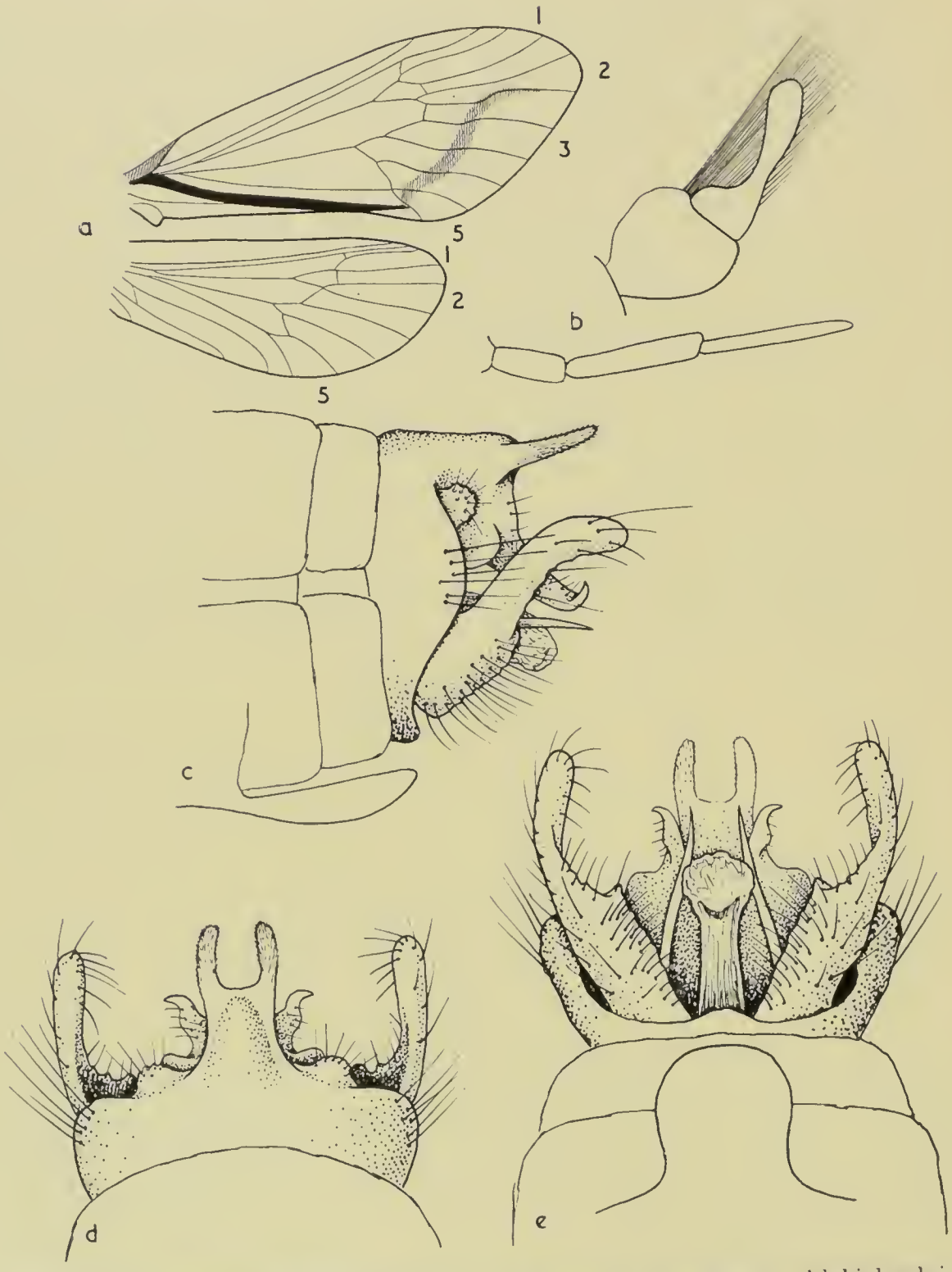

FIG. 85.—*Olinga feredayi* (McLachlan). ♂. *a*, wings ; *b*, maxillary and labial palpi ; *c*, genitalia, lateral ; *d*, dorsal ; *e*, ventral.

the tarsal joints are furnished beneath with sparse short spines, and the claws are very short.

"*Wings—anterior wings* smoky; the scales greyish-yellow; the subapical furrow very conspicuously yellow, in consequence of the scales being there so much denser; the fringe of the inturned lobe at the base of the costa is black; neuration

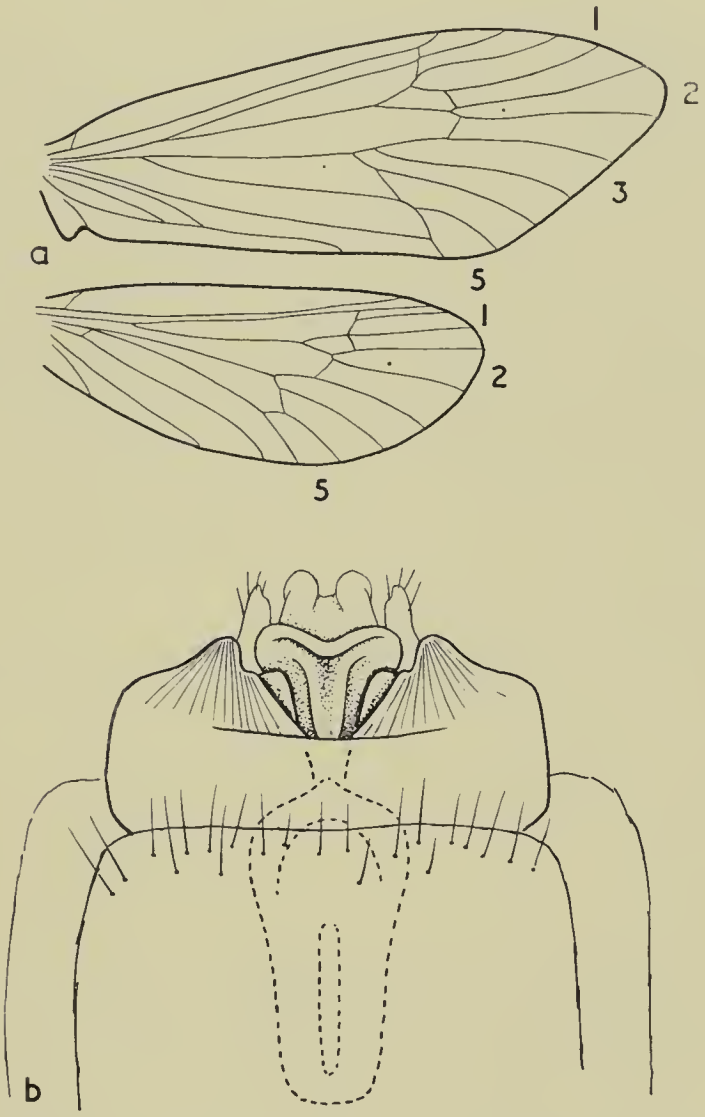

FIG. 86.—*Olinga feredayi* (McLachlan). ♀. *a*, wings; *b*, genitalia, ventral.

darker; *posterior wings* pale smoky, scarcely subhyaline, the costal edge faintly yellowish; fringes smoky cinereous.

"*Abdomen* blackish fuscous; appendices yellow; the lobe from the last dorsal segment ends in two nearly parallel branches, each of which is obtuse; lobe of the antepenultimate ventral segment very broad and obtusely rounded, the sides nearly parallel; the app. sup. are either very small and concealed, or are wanting; app. inf. long, curved upwards, obtuse, and fringed with blackish hairs; from beneath the dorsal lobe proceed two slender spines (app. intermed. ?), the apices of which are

abruptly turned outwards ; beneath these are two needle-shaped and slightly curved penis sheaths ; the penis itself is short, obtuse, and dilated at the apex (♂).

" Long. corp. 2½‴ ; exp. alar. 9‴.

" Christchurch, Canterbury (Fereday), 1 ♂."

To McLachlan's description I add the following :

On the *frons* is a pair of large, rounded processes densely covered with androconia-like hairs which may be extended to form a rosette round the processes. No doubt these function as scent-organs, since they occur only in the ♂.

A further description of the *genitalia* is also added. From above, distal margin of the ninth segment very wide and produced at the centre in a pair of rather short, more or less parallel processes arising from a common base ; on each side of these processes, midway to the lateral angle, is a large, rounded wart. Upper penis-cover formed by two processes directed downward, with their apices turned upward and outward. Penis membranous, slightly arched at its apex. There is a pair of spines which may be penis-sheaths or branches of the inferior appendages, from which they seem to arise. The inferior appendages are broad at the base, cut back at right angles at about midway, as seen from beneath, to form a slender apical portion ; this, from the side, is slightly arched with rounded apex. A broad, spatulate process to the seventh sternite.

Length of the anterior wing, ♂, 10·5 mm.

Genitalia, ♀.—From beneath, the terminal segment appears as a pair of small, rounded lobes separated from each other by a U-shaped excision ; on each side is a process rather shorter than the central pair with an irregular outline ; beneath the lobes is a wide plate, wider at the excised apex than at the base ; this is set in an excision between two massive plates.

Numerous examples in the British Museum (N.H.) from various localities in New Zealand.

Hudson records the following of the biology of this insect :

" The larva is extremely abundant in most running streams. It constructs a perfectly smooth, light brown, semi-transparent and slightly curved cylindrical case, made entirely of a glutinous material secreted by the insect. These cases are to be found in the streams during the entire year, but many of those taken about December are very small, apparently indicating that the larva chiefly grows during the late summer, autumn and winter, usually becoming mature in the spring. Some full-sized cases are, however, always to be found, and prolonged investigations prove that the successive broods of this insect must overlap one another to a very great extent.

" The length of the larva, when full-grown, is about ⅜ inch, that of its case being about ½ inch. The head and first segment of the thorax are very horny, and bright reddish-brown in colour. The anterior legs are short and very stout, the other two pairs are rather long and much slenderer. The remaining segments of the body are very large, soft, and bright green in colour. The two terminal segments are slightly paler. The last segment has two very large protuberances fringed with bristles and furnished with a pair of very small claspers.

"This larva is very active, climbing amongst the stones in rapid streams with great agility. When full grown it fastens the posterior end of its case firmly to a stone, and closes the free end with a tight-fitting lid. These fixed cases are usually found in groups, comprising twenty or thirty individuals, attached close together on the underside of a single boulder. This habit of congregating in groups for the purposes of pupation is very remarkable, and it probably serves some useful purpose, though at present it is difficult to say in what way it is beneficial to the insect.

"During the early summer most streams become very much smaller in volume, and owing to this circumstance many of these groups of fixed cases are left high and dry, and their inmates must consequently meet with an untimely death. In fact, the mortality experienced by the insect from this cause alone must be very considerable.

"The pupa leaves the case by forcing open the lid which closes its free end. After this is accomplished, it swims about for many hours before the final emergence of the caddis-fly takes place.

"The length of the pupa is about $\frac{3}{8}$ inch. The head and thorax are pale green, the abdomen bright green. The eyes are prominent, dark reddish-brown; the mandibles are short, slender, horny, and much curved at the tips. The legs and wings are very delicate in structure, elongate, and semi-transparent. The abdomen has a pair of brown chitinous spots on the back of segments 2, 3, 4 and 5, and a double pair of such spots on segment 6. The dorsal appendages are slightly chitinous and brown; the ventral ones semi-transparent. There is an extremely fine black line extending down the side of the abdomen.

"The perfect insect appears from the beginning of November until the end of February. It flies freely at evening dusk, when specimens may often be obtained in considerable numbers. It sometimes happens that females thus captured are found to be carrying their eggs, which are attached to the end of the body, and form a bright green globular mass."

4. Fam. **PHILANISIDAE** nov.

Hydropsychidae Walker, *partim.*
Rhyacophilidae Brauer *et al.*, *partim.*
Sericostomatidae Ulmer *et al.*, *partim.*

Insects of moderate size. *Palpi* dissimilar in form in the two sexes but five-jointed in both, terminal joint neither articulated nor flexible. *Ocelli* absent. *Spurs* 2, 2, 4. *Anterior wing*, ♂, forks nos. 1 and 2 present; in the ♀, 1, 2, and 5; discoidal cell long, unusual in shape with the upper margin concave and sinuous; posterior wing, forks nos. 1 and 5 present and discoidal cell absent in both sexes.

Both Brauer and Ulmer indicate that the discoidal cell is present in the posterior wings in both sexes. I have carefully examined 23 examples, male and female, in the British Museum (N.H.), and have failed to find a discoidal cell in the posterior wing except in one aberrant example from Sydney. In this specimen the cell is present on one side and absent on the other.

Philanisus was placed in the *Hydropsychidae* by Walker and its synonym, *Anomalostoma*, in the *Rhyacophilidae* by Brauer. Ulmer transferred the genus to the *Sericostomatidae* regardless of the presence of five joints in the maxillary palpi in both sexes, but considering this feature as an aberrant instance. At

my request Dr. Ulmer has kindly described a larva from the British Museum (N.H.) collection in this work, and he now agrees with me that neither the larva nor the adult will fit into any of the existing families. Rather than disregard Kolenati's great subdivisions of the *Aequipalpia* and the *Inaequipalpia* which have proved of such value in the study of the Trichoptera, I am here erecting a new family to take this extraordinary insect.

Philanisus Walker.

Philanisus Walker, 1852, *Cat. Neur. Brit. Mus.*, **1** : 115–116.
Anomalostoma Brauer, 1865, *Verh. Zool. Bot. Ges. Wien.*, **15** : 422.
Philaniscus Hutton, 1899, *Trans. N. Zeal. Inst.*, **31** : 243.
Philaniscus Hudson, 1904, *N. Zealand Neur.* : 78.
Philanisus Ulmer, 1907, *Gen. Insect.*, **60a** : 98.

Walker describes the genus as follows:

"Maxillary palpi with the fifth joint long, filiform: antennae nearly filiform, rather stout, almost as long as the wings: fore tibiae with two very short spurs at the tips; middle tibiae with a pair of long spurs at the tips; hind tibiae with two pairs of long spurs, one at three-fourths of the length, the other at the tips."

To this I add:

Ocelli absent. *Maxillary palpi* dissimilar in form in the two sexes, five-jointed in both. *Spurs* 2, 2, 4. *Anterior wing* ♂, forks nos. 1 and 2 present; in the ♀, 1, 2 and 5; discoidal cell long, unusual in shape with the upper margin concave or sinuous; in the posterior wing, discoidal cell wanting in both sexes and with forks nos. 1 and 5 present.

Type species.—*Philanisus plebeius* Walker, 1852.

Philanisus plebeius Walker (figs. 87–92).

Philanisus plebeius Walker, 1852, *Cat. Neur. Ins. Brit. Mus.*, **1** : 116.
Philanisus plebeius Hagen, 1864, *Verh. Zool.-Bot. Ges. Wien.*, **14** : 854.
Anomalostoma alloneura Brauer, 1865, *Zweiter Bericht. Novara Neur.*, : 422.
Anomalostoma alloneura Brauer, 1866, *Reise Novara Neur.* : 16, pl. 1, fig. 6.
Philanisus plebejus McLachlan, 1868, *Journ. Linn. Soc. Zool.*, **10** : 214.
Philanisus plebejus Brauer, 1868, *Verh. Zool.-Bot. Ges. Wien*, **18** : 412.
Philanisus plebejus McLachlan, 1873, *Ann. Mag. N. H.* (4) **12** : 42.
Philanisus plebejus McLachlan, 1882, *Journ. Linn. Soc. Zool.*, **16** : 417–422.
Philanisus plebejus McLachlan, 1887, *Ent. Mon. Mag.*, **24** : 154.
Philaniscus plebejus Hutton, 1899, *Trans. N. Zeal. Inst.*, **31** : 243.
Philaniscus plebejus Hudson, 1904, *N. Zealand Neur.* : 79, pl. 9, fig. 10.
Philanisus plebejus Ulmer, 1907, *Gen. Insect.*, **60a** : 99, pl. 12, figs. 106–7.
Philanisus plebejus Tillyard, 1926, *Ins. Austral. N. Zeal.*, : 394, figs. Y8, Y13.
Philanisus plebejus Betten and Mosely, 1940, *F. Walker Types Trich. B.M.* : 238, figs. 121–2.

Walker describes the species as follows:

"*Male.*—Tawny, thinly clothed with tawny hairs: antennae testaceous, rather stout, slightly setaceous, much longer than the body; legs testaceous, long; fore-tibiae without spurs; hinder tibiae with two pairs of long spurs, one pair near the

tips, the other at the tips: abdomen with two appendages at the tip: wings narrow; fore-wings slightly gray, with pale brown marks or interrupted bands; hind-wings subhyaline. Length of body $2\frac{1}{2}$–$2\frac{3}{4}$ lines; of the wings 7–$8\frac{1}{2}$ lines.

"*a*, *b*, New Zealand. Presented by Dr. Sinclair."

To this may be added: *Antennae* stout, yellow, the segments broadly ringed with brown; immediately before the antennae there is a broad, projecting process whose anterior margin is thickly clothed with long, yellow,

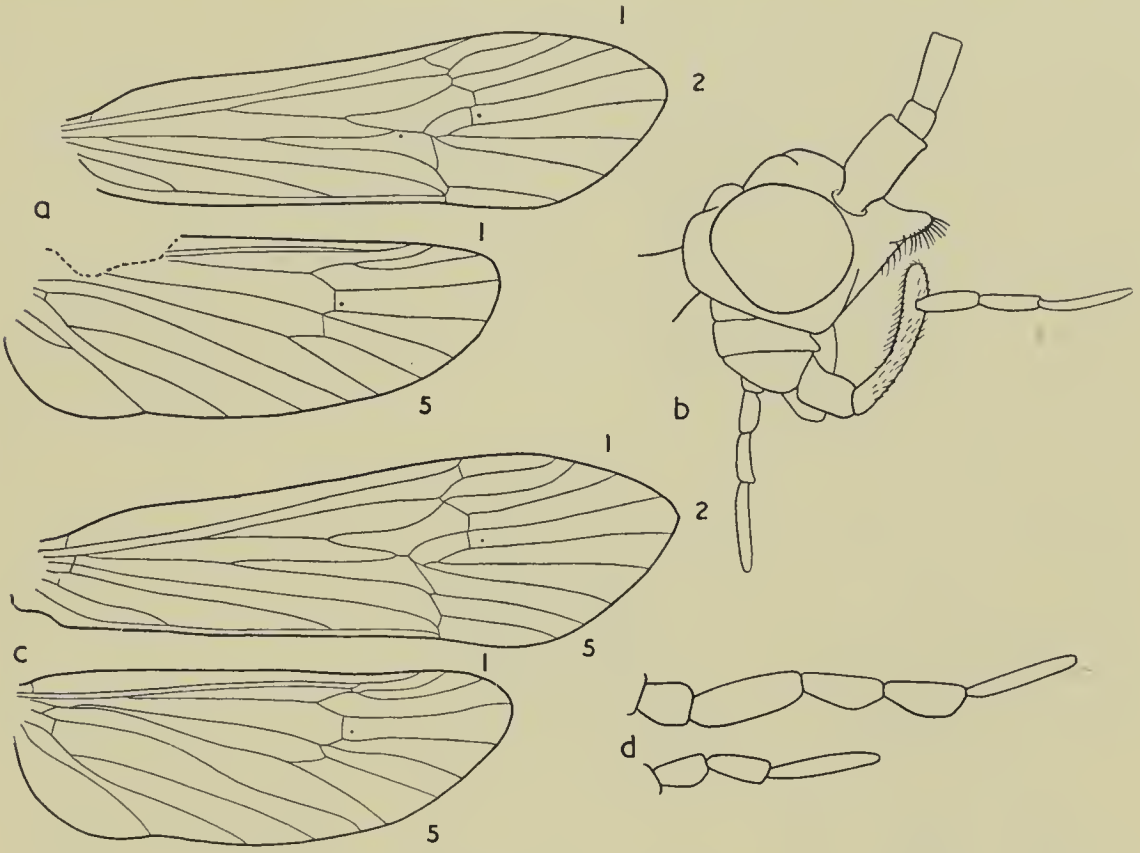

Fig. 87.—*Philanisus plebeius* Walker. *a*, ♂ wings; *b*, ♂ head, lateral; *c*, ♀ wings; *d*, ♀ palpi.

scale-like hairs. *Maxillary palpi* in the ♂ with the first joint short, second long, curved, third inserted before the apex of the second, third and fourth about equal in length, fifth a little longer; in the ♀, basal joint short, second about twice as long, third as long as the first, fourth a little shorter than the third, fifth about as long or slightly shorter than the second; labial palpi in both sexes, basal joint short, second a little longer, third longer than the second.

Genitalia, ♂.—Distal margin of the ninth segment widely excised. Two very long, black spines in the cavity appear to represent an upper penis-cover, with two small processes on its upper surface at the base; between the spines is a long penis with a slender stem and gradually dilated apex. Inferior appendages very large, furcate, directed upward and distally. From above, the

apices are obliquely truncate, inner angles forming blackened, rounded knobs ; from the side, the appendage curves distally with a claw-like branch arising on the lower margin, directed upward ; from beneath, the bases of the appendages are fused together with a short, narrow excision between. Apical margin of the ninth segment deeply and roundly excised ; a spatulate process to the seventh sternite.

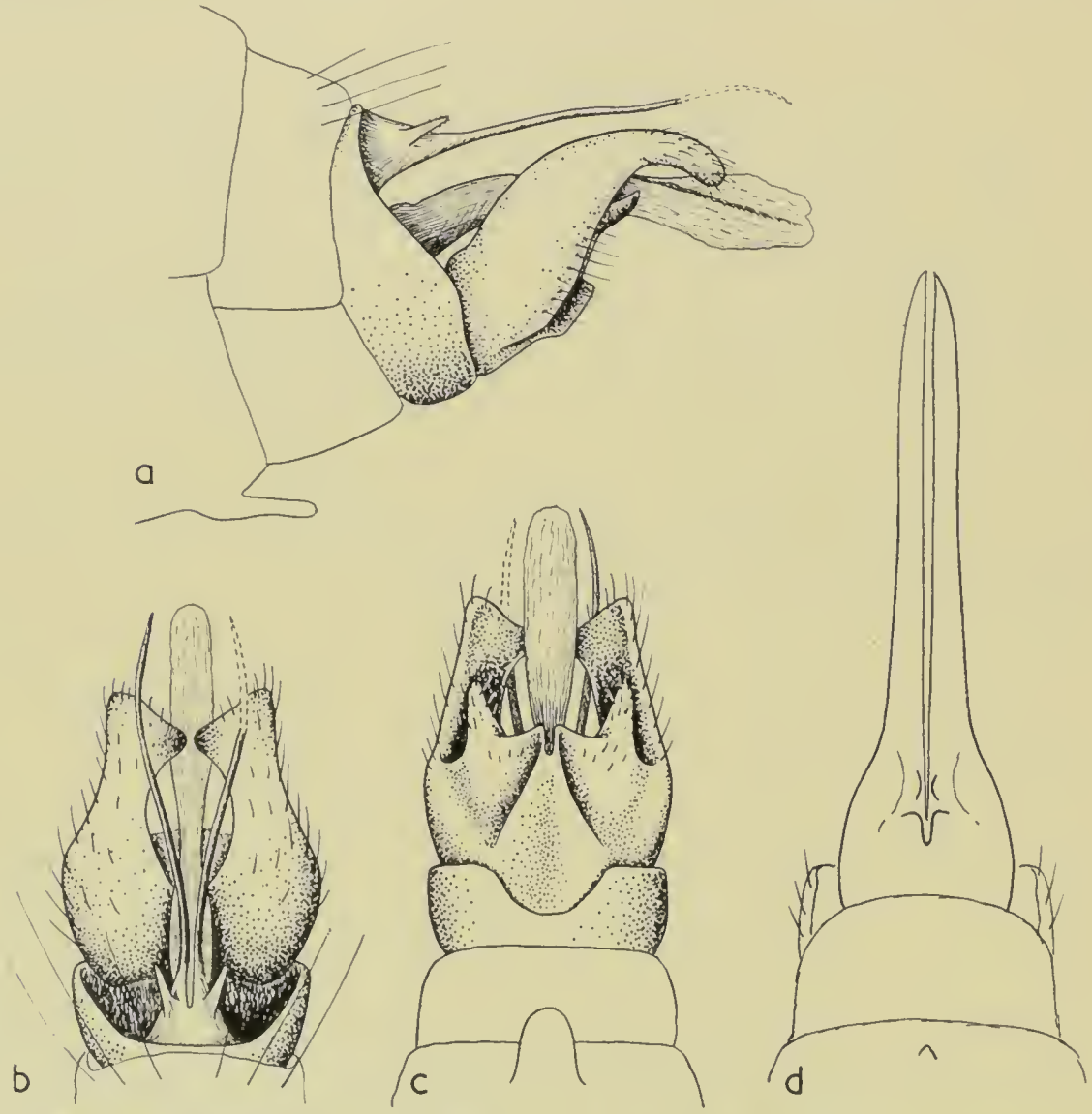

FIG. 88.—*Philanisus plebeius* Walker. *a*, ♂ genitalia, lateral ; *b*, dorsal ; *c*, ventral ; *d*, ♀ apex of abdomen, ventral.

Genitalia, ♀.—The ninth segment terminates in a pair of strongly chitinized and closely adpressed spines which are as long as the seventh and eighth segments together ; a small process to the seventh sternite.

Length of the anterior wing, ♂, 7·5 mm.; ♀ 10 mm.

Philanisus plebeius provides the first record of a marine caddis fly. It was

originally found in Lyttleton Harbour, Christchurch, New Zealand and subsequently on the Australian coast at Sydney, N. S. Wales.

Hudson describes the habits as follows :

" The larva inhabits rock-pools on the sea-beach, and is commonest near low-water mark, where it is completely outside the influence of any fresh water. It constructs a cylindrical case of coralline seaweed, a few minute stones, etc., being occasionally incorporated with the weed in the walls of the case. The length of a case belonging to a full-grown larva is generally about ½ inch. In addition to the small fragments of seaweed, which form the body of the case and are mostly arranged transversely on its surface, long branching fragments are also frequently attached. These accessories undoubtedly very much increase the protective value of the case, and render its discovery, amongst large clumps of seaweed, a task of the utmost difficulty. In fact, the smaller cases are quite impossible to detect, and this circumstance no doubt often prevents the enclosed larva from being destroyed by the numerous and rapacious enemies to which a minute marine form must be constantly exposed. As I have found cases of all sizes in considerable numbers both in October and also in January, it may, I think, be fairly assumed that the larvae live in the sea during the winter months, and in fact, throughout the entire year.

" When full grown the larva firmly fixes its case to the coralline seaweed, and closes up both ends with a loose network of silk, after which the enclosed insect is transformed into a pupa. This pupa has very strong mandibles, which are no doubt serviceable to the creature when escaping from the case. As is usual with caddises, the pupa swims about for some hours before the final transformation takes place.

" The perfect insect appears about January. It frequents rocks on the sea-beach, and is sometimes extremely abundant. I have met with it in great numbers on the open coast, near the entrance to Wellington Harbour, where I also obtained many of the larvae. Although I made a careful search amongst the seaweed in rock-pools inside the harbour, I was unable to find a single specimen. I understand from Captain Hutton that the same, or a very similar marine caddis-fly, has been found in Sydney Harbour ; and seeing that the insect is evidently most at home in the open sea, there appears to be no reason why this adventurous little species should not be widely distributed throughout the whole of the South Pacific Ocean."

At Mr. Mosely's request, Dr. Georg Ulmer kindly consented to make a description of the larva.

The Larva of Philanisus plebeius Walker (figs. 89–92).

By G. Ulmer.

There are two larvae before me, kindly sent by Mr. Martin E. Mosely.

The *larva* is eruciform ; *head* and *prothorax* of equal width, *body* somewhat broadened from the mesothorax to the second abdominal segment, then slowly diminishing.

Head, including the mouthparts, broad oval, somewhat protuberant in the region of the eyes. The *eyes* are lying in the foremost quarter of the head capsule ; they are black, their environs clear. *Antennae* very small, situated somewhat nearer to the mandibles than to the eyes and somewhat more ventral than the latter ; they are cylindrical, with a very small sensory rod. Ground-

colour of the head creamy white, but this colour is superseded by brown-umber in many parts, especially on the dorsal surface, so that when one looks upon it with a low-power lens the head seems to be dark ; the dark colour is to be found on the clypeus, the ante-clypeus and the labrum ; the pleurae (genae) are also dark excepting a clear, irregularly-bounded, longitudinal stripe each side ; these two stripes are connected by a narrow, clear stripe along the hind border of the head, broadening in the middle behind the clypeus to a larger, clear spot. The ventral side of the head is mostly clear ; only the gula and the fore and hind borders of the head are brown-umber or sooty-brown. All the clear parts of the head, especially on the dorsal side, contain several rows of partly confluent, dark irrorations ; similar darker, somewhat indistinct spots are to be found on the darker portions of the head, here and there, but not on the labrum nor on the gula. The whole dorsal surface of

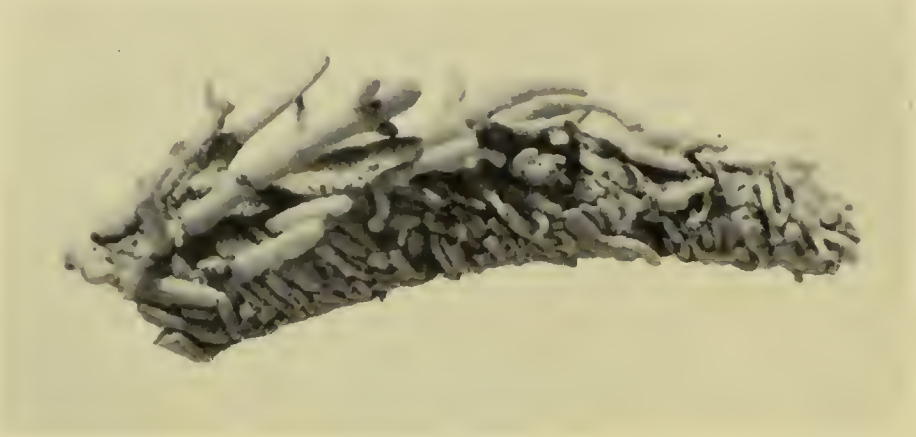

Fig. 89.—*Philanisus plebeius* Walker. Larval case. (Photo. D. E. K.)

the head is beset with long, black hairs arising partly from the dark spots but more densely at the fore margin of the head, in the vicinity of the eyes and at the sides of the clypeus ; the ventral surface of the head is sparsely haired.

Clypeus limnephiloid, its deepest incision lying somewhat behind the middle. *Labrum* with somewhat thickened and darker borders, square-elliptical, its anterior border concave in the middle ; at each side of this notch there are two clear, thorn-like bristles (1 and 2 *sensu Nielsen*), and further on, in the direction of the fore corners, are clear hairs ; there are numerous bristles on the npper surface but only towards the fore border, the larger hind part of the labrum being nearly bare ; numerous long, somewhat thinner bristles are at the side borders, from the fore corners to nearly the middle of these borders ; the bristles of the labrum are nearly equal in length, so that it is difficult to say which of them may be the normal ones ; the bristles 3. 5, 6 seem to be situated very near to the fore corners of the labrum, the bristle 4 nearer to the median line than is usual ; besides these four long bristles are two, somewhat irregular rows of about eleven long bristles on each side of the median

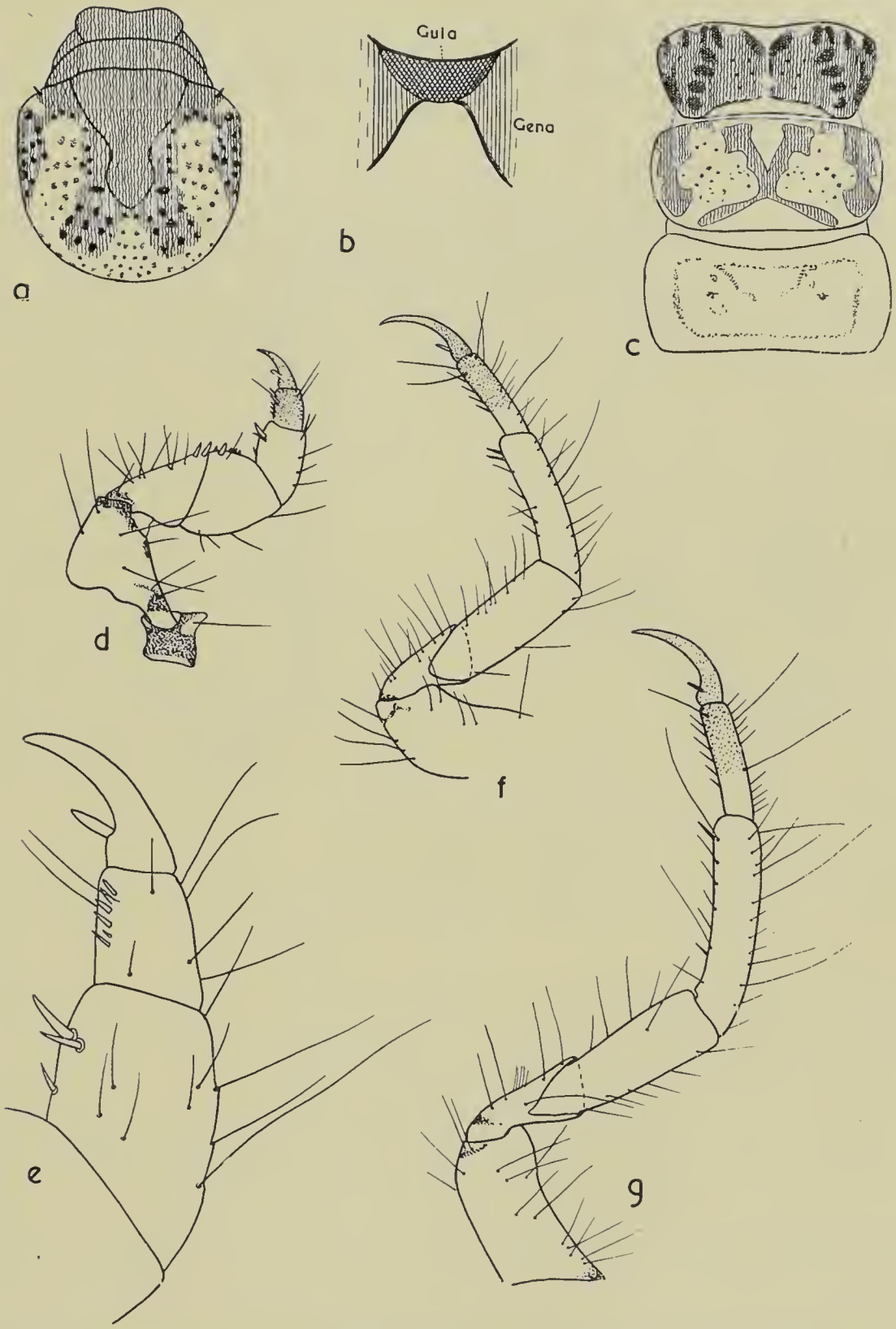

FIG. 90.—*Philanisus plebeius* Walker. Larval details. *a*, head ; *b*, gula ; *c*, thorax, dorsal ; *d*, anterior leg ; *e*, tibia and tarsus of anterior leg, more enlarged ; *f*, median leg ; *g*, posterior leg. (Figs. *a–c* after pencil sketches by Dr. G. Ulmer).

line. The *mandibles* are black or pitch-black, symmetrical, chisel-like, with four blunt teeth on the apical edge : in lateral view they are broad triangular, their base square ; there is a strong brush of bristles at the inner side ; on

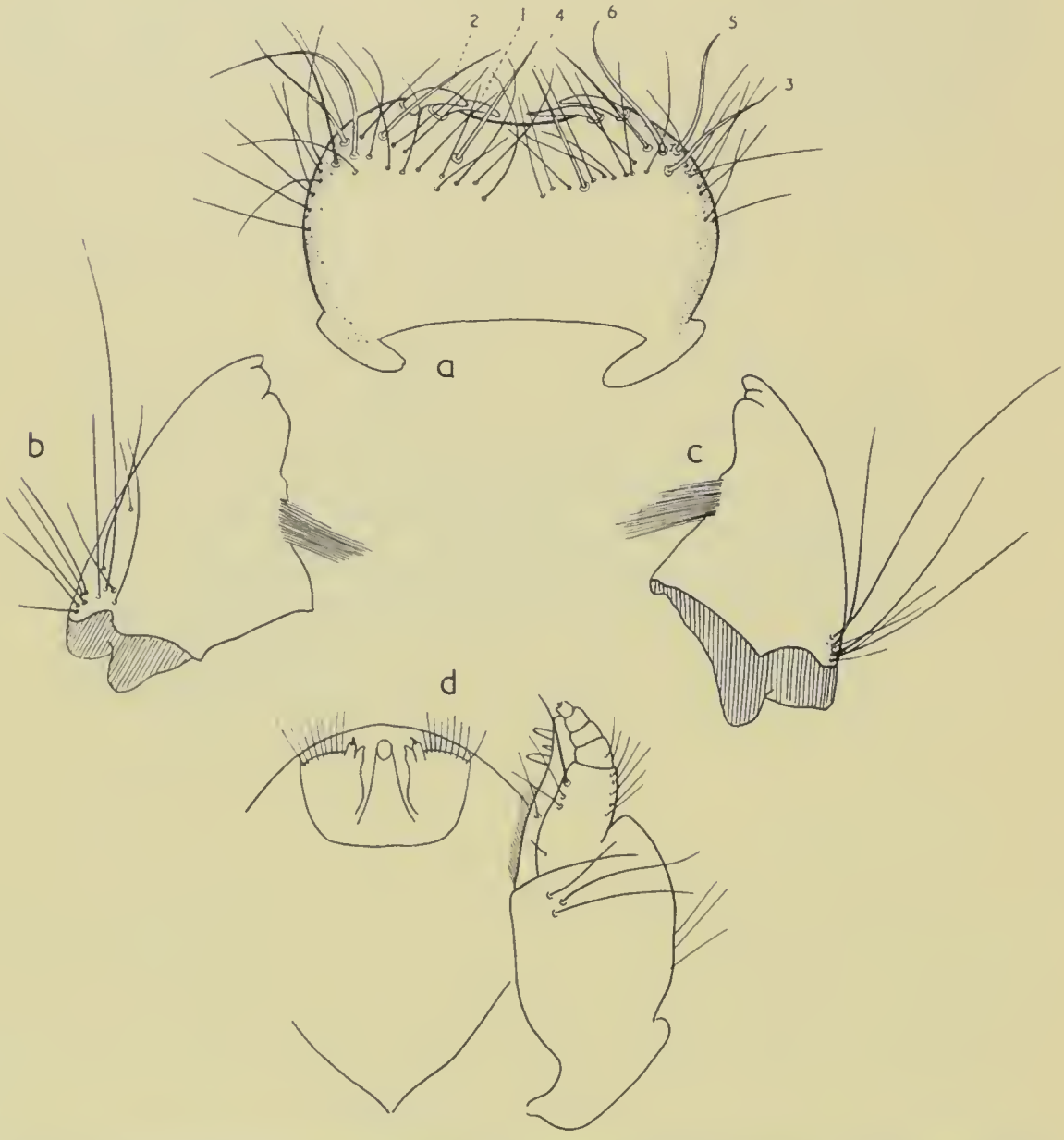

Fig. 91.— *Philanisus plebeius* Walker. Larval details. *a*, labrum ; *b*, left mandible ; *c*, right mandible ; *d*, maxilla and labium, from above.

the back near the base, there are numerous long and several shorter bristles. *Maxillae* and *labium* clumsy, not much projecting : maxillary lobe blunt and conical, with three spines at the inner border and with sensory rods at the apex ; *maxillary palp* adpressed to the lobe, bent, with four joints and with a fifth sclerite at the base ; the first joint is the largest, the following two

being nearly equal but smaller than the first, the fourth the smallest ; labial lobe hemispheroid, *labial palpi* very small, hidden by the apical border of the lobe. Gula transverse, semi-lunar, the occipital margins just reaching it from behind.

The three segments of the *thorax* broaden gradually to the metathorax. The shield of the pronotum covers the whole surface, and against its dark colour may be seen small, creamy white spots at the borders ; the colour is a clear brown-umber with darker points and spots which are not sharply defined and are only visible with a higher power ; the clear middle line of the pronotum widens behind in a small square spot ; the hind border of the shield is darker and somewhat elevated each side, slightly sinuous ; the fore border of the shield is notched several times, or perhaps the pattern of the dark

Fig. 92.—*Philanisus plebeius* Walker. Larval details. *a*, last abdominal segments from above ; *b*, anal proleg, ventral. (*a*, after a pencil sketch by Dr. G. Ulmer.)

colour merely suggests this ; fore and hind corners of the pronotum are rounded ; the pronotum is beset everywhere, especially in the oral half, with numerous long, black bristles (appearing white in some lights) ; they are most numerous on and near the fore margin, projecting considerably over the hind part of the head ; the fore half of each lateral border is also beset with long bristles, directed forwards. The shield of the mesonotum is somewhat less horny, the creamy white colour is much extended, and the darker brown-umber colouring is to be found only in a large spot forming a V in the middle part, in a lateral, longitudinal stripe and in an oblique stripe at the hind border which is not so dark ; rather numerous dark points and dimples are on the clear parts ; at the fore border on each side, between the dark V and the lateral dark stripe, there is an indistinct dark spot, more or less rectangular ; the large dark markings or areas are bounded irregularly and excised several

times : the bristles on the mesonotum are similar to those of the pronotum. The metanotum is gray, with a weak, drab-coloured shield, hardly discernible : near the hind corners is a somewhat darker spot, and there are two pairs of small, dark clouds more to the middle of the shield ; the hairy covering similar to that of the mesonotum but more feeble ; the darker spots bear bristles.

The underside of the thorax is a clear, olive-gray ; no thorn-like horn is visible on the prosternum ; meso- and metasternum with some bristles.

Legs : fore legs shortest and thickest, middle legs longer, hind legs the longest ; they are of a clear, olive-gray colour, the tarsi nearly to their bases, and the claws are darker, more brown-umber or sooty brown : the trochantines, especially of the fore legs, the bases of the coxae, the joinings between coxa and trochanter, the apical borders of the femora are likewise darker. All the legs bear numerous black bristles, especially on the outer borders. The joints of the fore legs are short ; coxa, trochanter and femur are of nearly equal size ; the femur is the broadest, tibia and tarsus are gradually shorter and narrower ; the claw is much bent, large, somewhat longer than the tarsus and bearing a thick basal spur, about a quarter of the length of the claw ; the trochantine has a blunt, conical apophysis with a long bristle on its surface ; the inner margin of the trochanter has, at its apex, two strong spines ; same border of the femur with 1 short, 1 long and 3 short spines in succession ; all these spines are broad and bluntly pointed. Tibia at its inner margin without long bristles, with a thin spine nearer to its base and with two superimposed spines nearer to its apex, the thinner and more pointed of which is the upper ; these two spines are the apical spurs ; the tarsus at its inner border with 5 small spines and 1 long bristle. Middle legs much more slender than the fore legs and nearly twice as long ; tibia, tarsus and claw are considerably lengthened ; femur about $1\frac{1}{4}$ times as long as the trochanter, tibia only a little longer than the femur, tarsus shorter, nearly as long as the trochanter ; claw as long as the tarsus, much bent, the basal spur thinner than on the fore claw, only a sixth as long as the claw ; tibia at its inner margin without bristles, with 7 spines, of which the 2 last—the apical spurs—are somewhat stronger and closer together ; tarsus at its inner margin with 4 spines and near the apex with 2 long bristles, one of them on the upper surface, the other on the under. Hind legs, about $1\frac{1}{3}$ as long as the middle legs, are similarly formed, but the femur is longer and thicker, tibia and tarsus are longer in proportion ; claw shorter than the tarsus, a little longer than the middle claw, its basal spur only an eighth of the claw in length, the tibia is a little bent and has on its inner border 7 spines, and at or near this border 3 bristles, the last of which is very long and situated over the last spine ; for that reason there is present here only 1 apical spur ; tarsus at its inner margin with 6 spines and a long bristle.

Abdomen smooth, olive-gray like the underside of the thorax ; first segment short, with 3 low humps, the dorsal hump nearly without spicules ; on the venter with some long hairs like those of the metasternum, the dorsum without hairs or bristles ; no humps on the second segment ; sideline without

hairs and without chitinous points ; gills hardly visible, forming small bundles of five filaments (perhaps not always five). There are two dorsal rows of gills, from the hind border of the second segment to the fore border of the seventh, and two other rows, ventrally, from the hind margin of the second segment to the fore margin of the sixth ; both rows of the dorsum lie near together, as also do the two rows of the venter. The stricture between the eighth and the ninth segments is deep, especially as seen from above ; hind border of the ninth segment roundly protuberant in the middle ; tenth segment at both sides of its excision with a group of long bristles on and near the hind border ; one of these bristles, nearest to the anal proleg, is longer than the tenth segment, thick and deep black, the others are of various lengths and thinner. *Anal prolegs* yellowish, with dark joinings, short, two-segmented, with a hook on the strong, bent claw, which is dark brown.

Length of the larva, 6·5 mm., its breadth, 1 mm.

The foregoing description is based upon the smaller of the two larvae ; the larger of these has a length of 9 mm. and a breadth of 1·1 mm. ; the weak parts on thorax and abdomen of the larger larva are ochre-white, the dark colour on head and thorax is nearly a dark egg-yellow, the irrorations are rust-coloured ; legs with tarsi and claws darker, the joinings blackish.

The *case* of the larger larva has a length of 10 mm. ; its oral diameter is 2 mm., its anal 1·7 mm. ; it is cylindrically-conical, somewhat bent, the hind opening shut by a membrane with a large, central, circular hole ; the inner tube of the case is spun of olive-brown silk, and is covered with small bits of (in alcohol) white, coralline sea-weed, making the surface rough ; these bits are laid in a transversal manner, somewhat oblique ; the dorsal surface is beset with longer bits, mostly pointing obliquely upwards to the apex of the case, a pattern of structure called " Brems-Apparate " in the German description of *Drusus discolor* Rambur and others.

The larva of *Philanisus plebeius* resembles superficially the larvae of the Lepidostomatinae, but there are important differences which make it impossible to place the species in this Subfamily.

	Lepidostomatinae.	*Philanisus plebeius.*
Labrum . .	Six pairs of bristles .	Six pairs of bristles and two square rows of numerous bristles in the fore half.
Mandibles . .	Two bristles on the back .	Numerous bristles on the back.
Prosternum .	With a spur-like horn .	Without a spur-like horn.
Gula . .	Oblong triangular, oviform or nearly heart-shaped, rather large, reaching to about the middle of the pleurae .	Semi-lunar, small, transverse, reaching to the occipital margins.

	Lepidostomatinae.	*Philanisus plebeius.*
First abdominal segment	Without a dorsal hump	With a dorsal hump.
Gills	Single	In tufts of five filaments.
Side-line	With a fringe of fine hairs and with chitinous points	Without hairs and points.

I do not know any subfamily or any family to which *Philanisus* might belong. We know of mandibles with numerous bristles on the back only from *Hydropsychidae*, and a labrum with two rows of numerous bristles only from the *Calamoceratidae*. *Philanisus* certainly belongs to the Integripalpia of Martynov.

I regret very much that I could not examine a pupa of this genus ; a pupa sometimes gives good clues to the relationship with kindred forms.

G. V. Hudson in his *New Zealand Neuroptera* records the marine habits of the larva and pupa, and describes both stages and also the case (l.c., pp. 79–80, pl. ix, figs. 7–9) ; there are certain discrepancies in his description of the larva in comparison with mine.—G. U.

5. Fam. **BERAEIDAE** Wallengren.

Beraeidae Wallengren, 1891, *K. Sv. Akad. Handl.*, **24** (10) : 111.
Beraeinae Ulmer, 1903, *Abh. Naturw. Ver. Hamburg*, **18** : 95.
Beraeinae Ulmer, 1907, *Gen. Insect.*, **60a** : 150.

Spurs 2, 2, 4. *Antennae* generally as long as the wings. Basal joint very stout, hairy, about as long as, or somewhat longer than, the head. *Maxillary palpi* long, densely hairy ; basal joints short, succeeding joints long and approximately equal. *Wings* densely hairy ; neuration irregular, differing in the sexes ; no discoidal cell in either wing. In *Pycnocentrella* there is a strong fold in the anterior wing of the male, and in *Alloecella warneria* a smaller fold.

Key to Genera, Males (Females not known).

1. Anterior wing without or with only a small fold ; forks nos. 2, 4 and 5 present. In posterior wing only fork no. 5, Rs apparently fused with M for about half its length . . . . . *Alloecella* Banks (p. 142).
–. Anterior wing with a strong fold along centre of wing ; forks nos. 1, 3 and 5 present. In posterior wing forks nos. 1, 2 and 5 present, Rs normal *Pycnocentrella* gen. nov. (p. 145).

Alloecella Banks.

Alloecella Banks, 1939, *Bull. Mus. Comp. Zool. Harv.*, **85** : 481.

Banks describes the genus as follows :

"A Molannid of the Beraea section ; spurs 2, 2, 4 ; palpi moderately long, porrect, the last three joints subequal ; antennae short, clothed with appressed, curved hairs, and short erect ones, as is sometimes seen in allied genera, basal joint about as long as the vertex, latter with elongate wart each side near eyes.

" Fore wing with discal cell open and no fork one, the radial sector running close to radius in basal part and apparently not connected to radius, the medius running into it towards base of wing ; no fork three, but forks four and five. In the hind wings, which are nearly as wide as the fore wings, is a large median area without veins, the lower side curving up and ending in three veins on outer margin. The fringes are not so long as in allied genera, but the hind wing near base has some hairs about as long as width of wing.

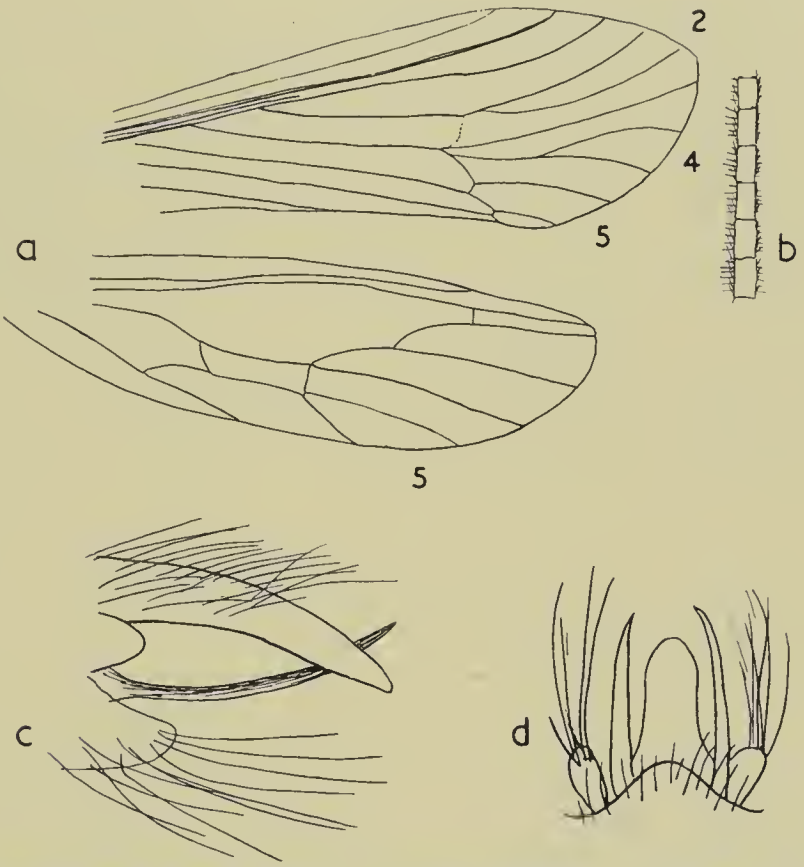

Fig. 93.—*Alloecella grisea* Banks. ♂ (after Banks). *a*, wings ; *b*, part of antenna ; *c*, genitalia, lateral ; *d*, dorsal.

" The venation, especially that of hindwing, is very distinctive."

Type species.—*Alloecella grisea* Banks, 1939.

The differences between the two species dealt with here will be best appreciated by reference to the figures of the ♂ genitalia.

Alloecella grisea Banks (fig. 93).

Alloecella grisea Banks, 1939, *Bull. Mus. Comp. Zool. Harv.*, **85** : 481, figs. 33, 34.

Banks describes the species as follows :

" Body black or brown ; head with some white hair, antennae black, legs pale yellowish ; wings dark, clothed with black hair, hind wings with more gray hair and fringes.

" In fore wings the radius is plainly thicker than other veins ; between the radius and radial sector towards base is a fine hyaline line or vein ; fork two reaches nearly to the cross-vein (indistinct) to medius ; fork four longer than its pedicel.

" Male genitalia short and not very distinct, very hairy : there is a long superior piece, the tip slightly bent down, a pair of lower, smooth, slender, pointed and slightly upcurved processes, and a broad ventral lobe with very long bristles.

" Fore wing 5 mm. long.

" From Mt. Donna Buang, Victoria, Australia, 6–7 Dec. (Darlington)."

Type in the Museum of Comparative Zoology, Harvard College, U.S.A.

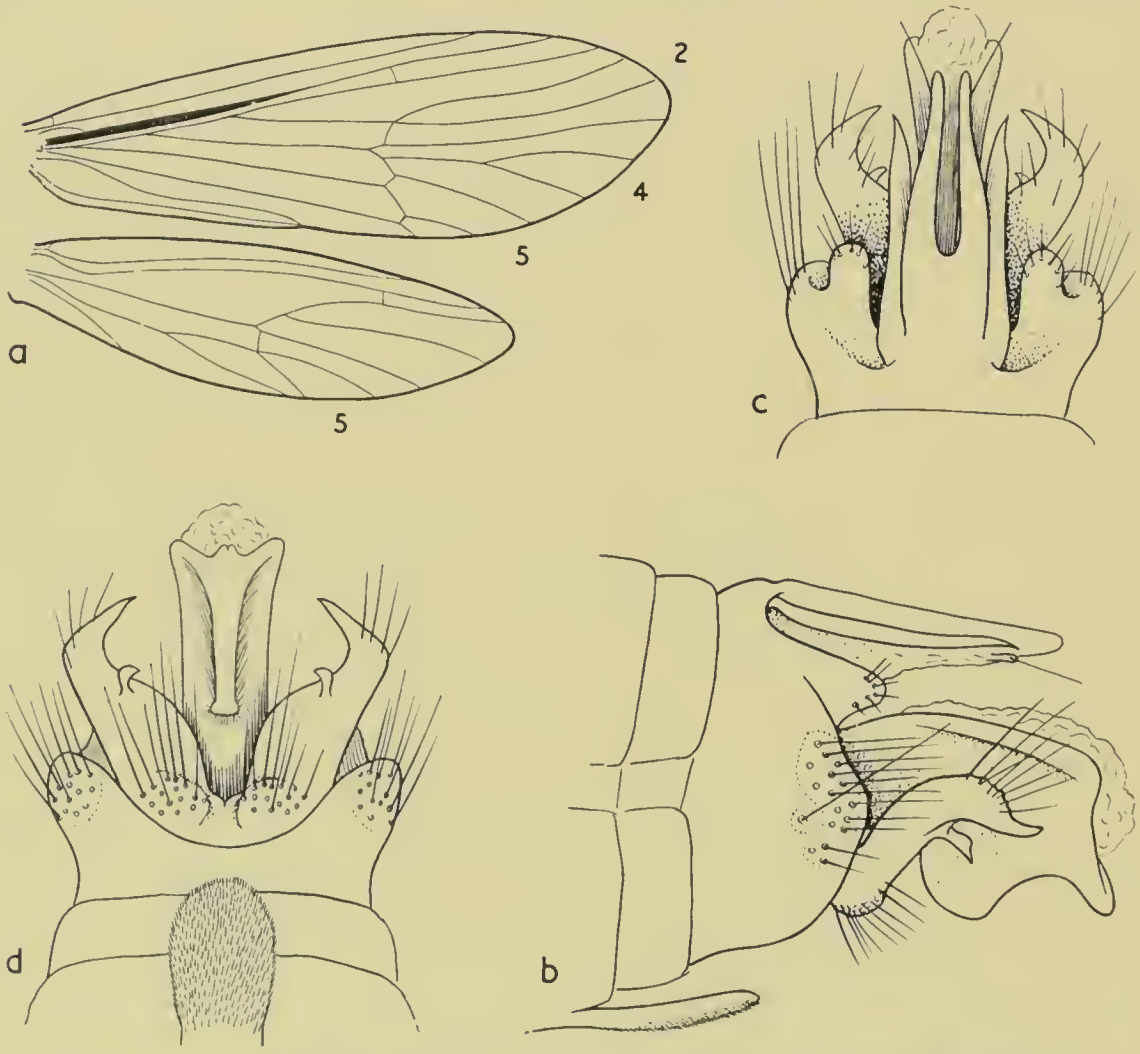

Fig. 94.—*Alloecella warneria* sp. n. ♂. *a*, wings ; *b*, genitalia, lateral ; *c*, dorsal ; *d*, ventral.

Alloecella warneria sp. n. (fig. 94).

Insect yellowish, *wings* densely covered with yellowish pubescence. *Maxillary palpi* wanting in the single example seen. Neuration with a fold in the anterior wing as figured.

Genitalia, ♂.—From above, ninth segment nearly obsolete, membranous and produced in a long, cleft dorsal plate which is superimposed on a large upper penis-cover (?); this, from the side, is very deep, terminating in a distally and downwardly directed beak and with the lower margin produced in a deep keel; on each side of the dorsal plate is a slender superior appendage, and beyond this the margin of the ninth segment is, on each side, produced in a rounded knob. I have not been able to make out the penis, which is obscure and may be confused with the upper penis-cover. Inferior appendages from beneath calliper-shaped, terminating in acute claws and with a small spur arising from near the inner margin in the bend of the callipers; the ventral margin of the ninth segment is deeply concave; a broad, spatulate process to the seventh sternite.

Length of the anterior wing, ♂, 5·5 mm.

AUSTRALIA: Victoria, Fernshaw, 21.xii.1884, 1 ♂ from the McLachlan Collection, mounted in balsam.

This species differs from *A. grisea* in the form of the genitalia.

Pycnocentrella gen. nov.

♂. *Spurs* 2, 2, 4. *Maxillary palpi* densely shrouded in hairs, but in a cleared example seen to be five-jointed; two basal joints short, moderately broad, third longer and broader, fourth and fifth about as long as third, slender. Labial palpi long, basal joint short; second and third each about twice as long as first. *Antenna* with the basal joint rather longer than the width of the head. A pair of membranous filaments on the vertex of the head. *Anterior wing* with a strong fold running the entire length of the wing, and a smaller one along the radius. Venation of the anterior wing obscured by the fold, probably with forks nos. 1, 3 and 5. Posterior wing without discoidal cell, forks nos. 1, 2 and 5 present.

Type species.—*Pycnocentrella eruensis* sp. n.

This genus may be distinguished from other Beraeids by the long fold in the anterior wing of the male. This fold gives it a decidedly Sericostomatid appearance, and it superficially resembles *Pycnocentria*, from which it may be distinguished by its five-jointed palpi in the male and the differences in venation.

Pycnocentrella eruensis sp. n. (fig. 95).

Between the bases of the *antennae* is a large, triangular projection, in front of which are four tufts of coarse hairs, the outer the larger; basal joint of the anntenae rather longer than the breadth of the head, black above, with a heavy fringe of golden-brown hairs beneath; remaining joints pale yellow, ringed with brown; on the vertex of the head is a pair of membranous filaments which, in the preparation, are entirely free from hairs (possibly denuded); *maxillary palpi* densely shrouded in a mass of fine, golden-brown hairs (not clavate). *Anterior wing* of a warm brown colour with a few yellow spots or patches (not irrorations); pubescence very dense; two folds in the anterior wing, one through the centre, a smaller at its base as shown in the figure.

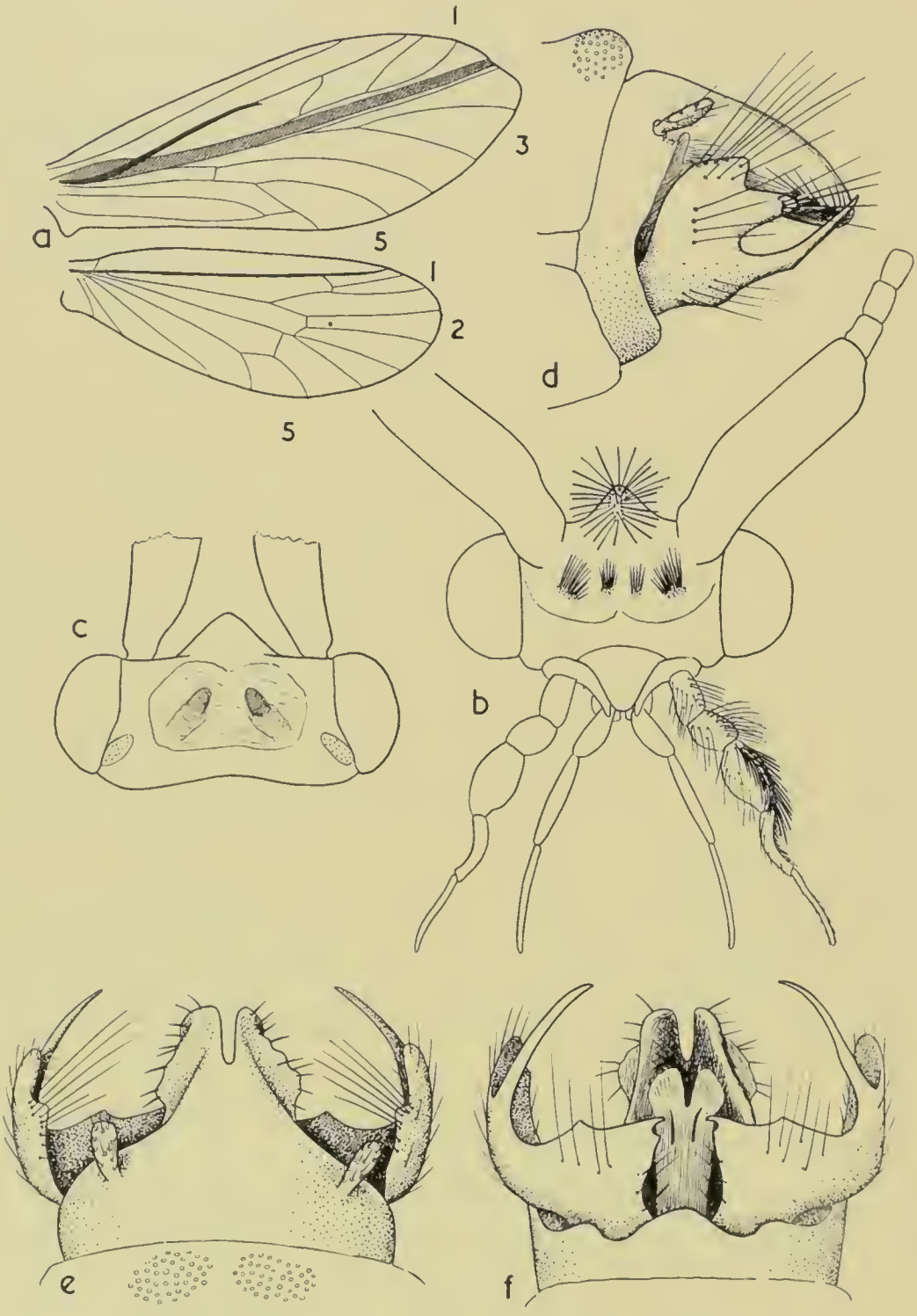

FIG. 95.—*Pyenocentrella eruensis* gen. sp. n. ♂. *a*, wings; *b*, head from in front; *c*, head from above; *d*, genitalia, lateral; *e*, dorsal; *f*, ventral.

Genitalia, ♂.—Eighth tergite with two raised, punctate patches at its apical margin, forming a round knob as seen from the side ; ninth tergite very wide at the base, triangular with two small superior appendages arising from its upper surface towards the sides ; apex produced and excised, the sides of the excision produced in flat shelves with serrate edges. Penis, from beneath, short, with an excised apex. Inferior appendages large, from beneath with wide bases, apices of the bases truncate and sinuate with the outer angles produced in long, upwardly and tailwardly directed, spine-like processes ; there is an upper branch to the appendage, stout and furcate from the side ; margin of the ninth ventral segment sinuous ; no ventral process.

Length of the anterior wing, ♂, 10 mm.

New Zealand : North Island, National Park, Erua, xii.1921, 1 ♂ (*type*) ; Wilton's Bush, 10.xi.1921, 1 ♂, G. V. Hudson.

6. Fam. **MOLANNIDAE** Wallengren.

Wallengren, 1891, *K. Sv. Vet. Akad. Handl.*, **24** (10) : 116.
Ulmer, 1907, *Gen. Insect.*, **60a** : 148.

Spurs 2, 4, 4. *Ocelli* absent. *Antennae* rather stout, as long as, or slightly longer than, the anterior wings. *Maxillary palpi* stout, hairy, the basal two joints short, the three following long ; terminal joint not flexible. Labial palpi small, basal joint shorter than second or third. *Wings* long and narrow, with rounded apices, anterior with dense pubescence ; neuration very irregular, often differing in the sexes ; discoidal and median cells absent in both wings.

Only one genus, *Molanniella* Banks, has yet been recorded from the Australian region.

Molanniella Banks.

Molanniella Banks, 1939, *Bull. Mus. Comp. Zool. Harv.*, **85** : 481–482.

Banks describes the genus as follows :

"A Molannid ; maxillary palpi moderately long, porrect, last joint pointed, almost as long as the preceding one ; basal joint of the antennae about as long as the vertex, latter with a large elongate wart each side close to eyes ; spurs 2, 4, 4.

" Fore wing with apparently forks two, three and five, the radial sector connecting to radius near base of wing ; between radius and radial sector is a wide space except near tip and towards base. Hind wings scarcely broader than fore wings, and with apparently four forks, the longest near hind margin towards base.

" Nearer to Molannodes than to Molanna, but the forkings are different."

Type species.—*Molanniella atra* Banks, 1939.

Molanniella atra Banks (fig. 96).

Molanniella atra Banks, 1939, *Bull. Mus. Comp. Zool. Harv.*, **85** : 482, figs. 67, 68.

Banks describes the species as follows :

" Mostly black, antennae and legs rather more brownish ; wings with black hair.

" In fore wing the first fork has a very short pedicel beyond the cross-vein obliquely

back to medius, the second fork has a pedicel about two-fifths of its length, fork five is broad at base; just before the cubitus joins medius toward base of wing is a cross-vein to the anal vein.

"In hind wings the first fork also has a short pedicel, the second fork a pedicel a trifle longer, this cross-vein runs obliquely to the next fork with a branch between them, another unbranched vein, and then a long fork, its base scarcely longer than the fork from base of wing. The female shows some clusters of golden hair at tip of the abdomen above, and below is a small median tooth from the next to last segment, just before the concavity.

"Fore wing, 6·5 mm. long.

"From Mt. Kosciusko, New South Wales, Australia, 5–7000 ft., 11 Dec. (Darlington)."

Type in the Museum of Comparative Zoology, Harvard College, U.S.A.

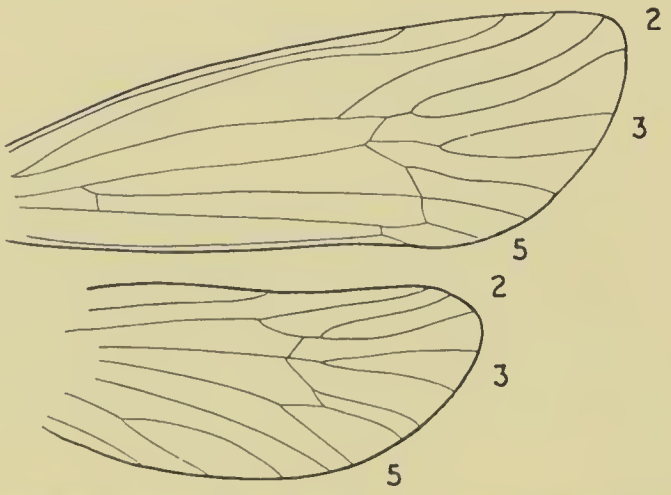

Fig. 96.—*Molanniella atra* Banks. ♀ wings (after Banks).

7. Fam. **HELICOPHIDAE nov.**

Insects small, but not minute. *Ocelli* absent. *Antennae* with the basal joint large and bulbous. *Maxillary palpi* five-jointed in both sexes, hairy, the terminal joint not articulated or flexible. In the *anterior wing*, in the ♂, forks nos. 1 (?), 2 and 3 are present, in the *posterior wing* only fork no. 2 present; in both sexes discoidal cell present in the anterior wing only. In the ♀ there is an additional apical cellule in both wings. *Spurs* 2, 2, 4. A process to the seventh abdominal segment.

This family contains at present only the single genus *Helicopha*, gen. n. It is perhaps nearer to the *Odontoceridae* than to any other family, but differs in its venation, notably in the absence of a thyridial cell in the anterior wing, and in the large vein-free area in the posterior wing.

Helicopha gen. n.

Ocelli absent. *Antenna* with the first joint large and bulbose; second about a third of the length of the first; third longer than the second, and

rather less than twice the length of each of the remaining joints. *Maxillary palpi* ♂ five-jointed : basal joint moderately short ; second and third longer and about equal ; fourth a little shorter ; fifth equal to, or perhaps a shade shorter than, the fourth. In the labial palpi the joints are short and equal. Spurs 2, 2, 4. *Wings :* anterior, discoidal cell short and triangular ; forks as detailed in the family diagnosis. Discoidal cell absent in the posterior wing, where there is a large space in which the nervures are obsolete ; forks as detailed in the family diagnosis ; sub-costa considerably thickened. A process to the seventh ventral segment.

Type species.—*Helicopha astia* sp. n.

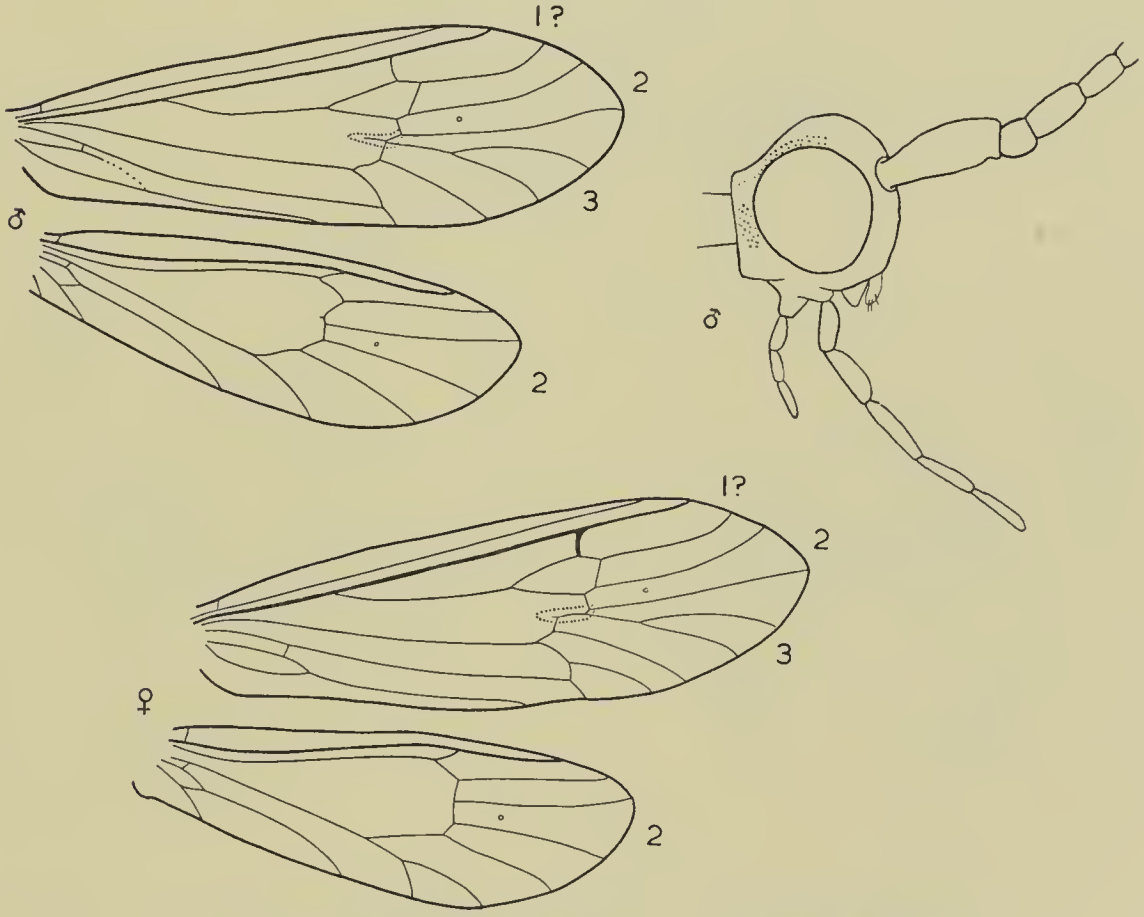

Fig. 97.—*Helicopha astia* gen. sp. n. ♂♀ wings and head.

Key to Species of *Helicopha*, Males.

1. Inferior appendage from side scarcely dilated about midway. Process to the 7th sternite small . . . . . *H. astia* sp. n. (p. 149).
–. Inferior appendage from side considerably dilated about midway. Process to the 7th sternite very large . . . . . *H. hortena* sp. n. (p. 152).

Helicopha astia sp. n. (figs. 97–99).

Insect small and dark. Neuration very irregular, as figured. Reference is made to it in the generic description.

Genitalia, ♂.—From above, ninth segment with a minute, triangular process or perhaps a darkly pigmented wart at the centre of its distal margin. Superior appendages small and blunt, appearing almost as arising from the margin of the segment. Upper penis-cover in the form of a produced, triangular hood, produced at the sides in a pair of widely-outstretched arms, whose apices are turned outwards at right-angles, and are armed with some peg-like spines. Penis membranous, dilated at the apex and directed downward. Inferior

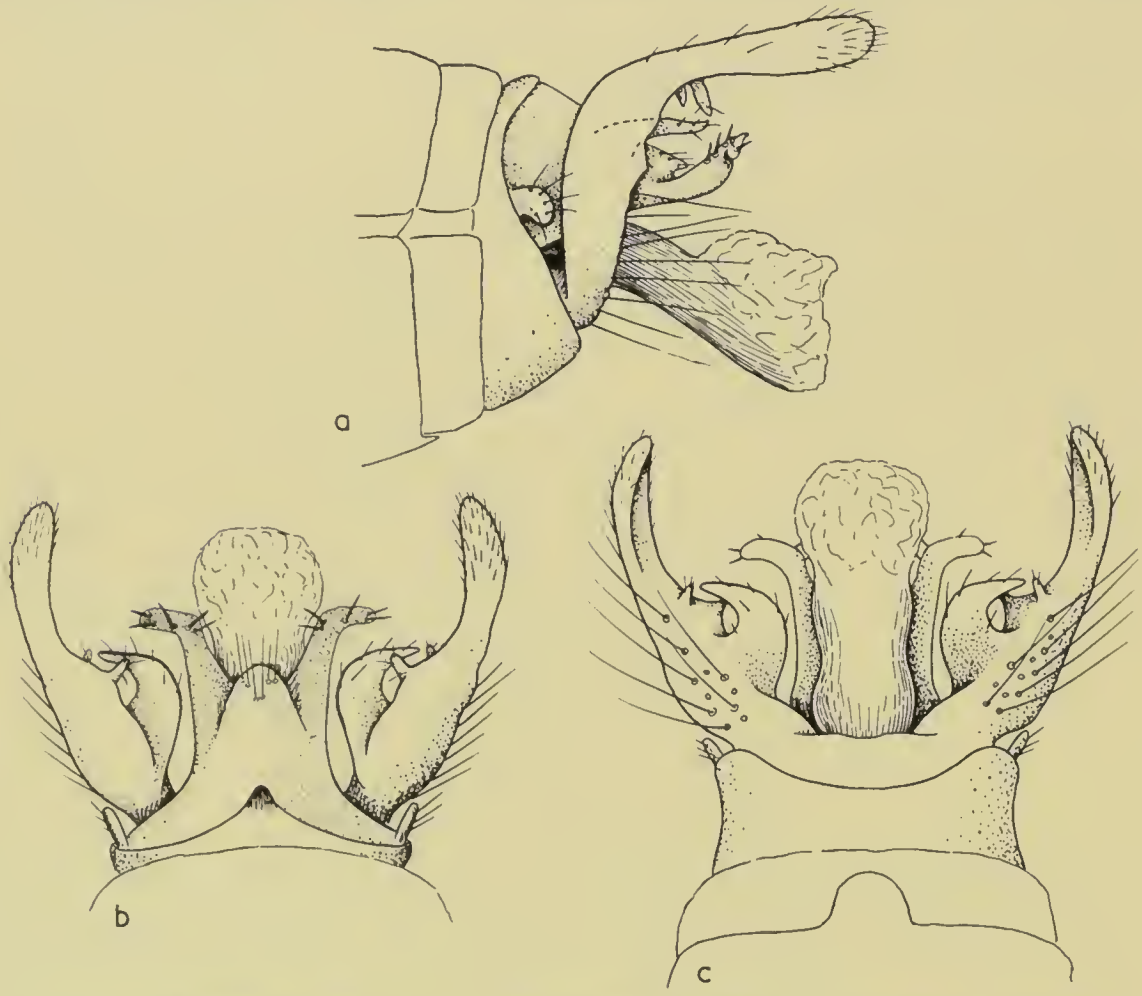

FIG. 98.—*Helicopha astia* sp. n. ♂ genitalia. *a*, lateral ; *b*, dorsal ; *c*, ventral.

appendages large, single-jointed, directed upward, bearing a sinuate branch or hook about midway, bent over at the apex towards the main stem which, at this point, is furnished with two small fingers. A short, rounded process to the seventh sternite.

Genitalia, ♀.—There is a pair of small, slightly curved and swollen processes arising from the lateral, lower margin of the antepenultimate segment ; this segment is broad from beneath, the apical margin slightly excised. The sixth and seventh sternites bear darkly pigmented, deep borders along the distal

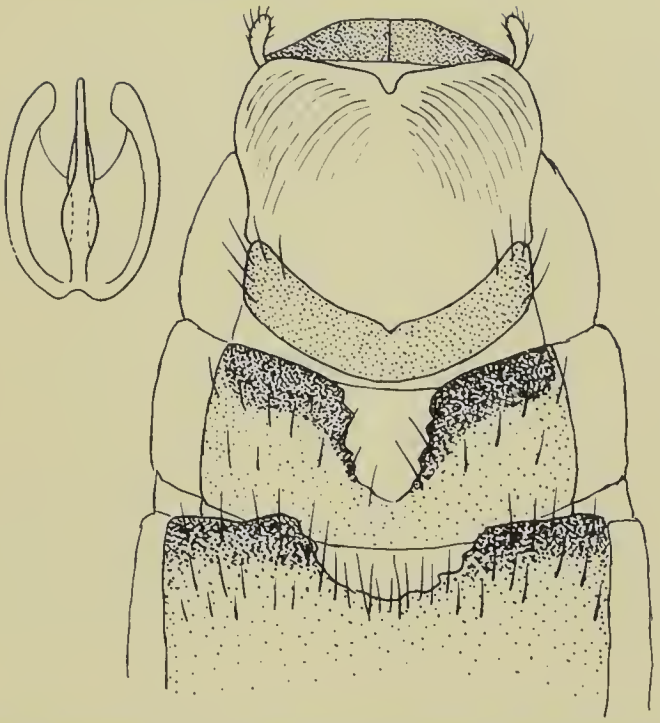

FIG. 99.—*Helicopha astia* sp. n. ♀ Apex of abdomen and vaginal structure, ventral.

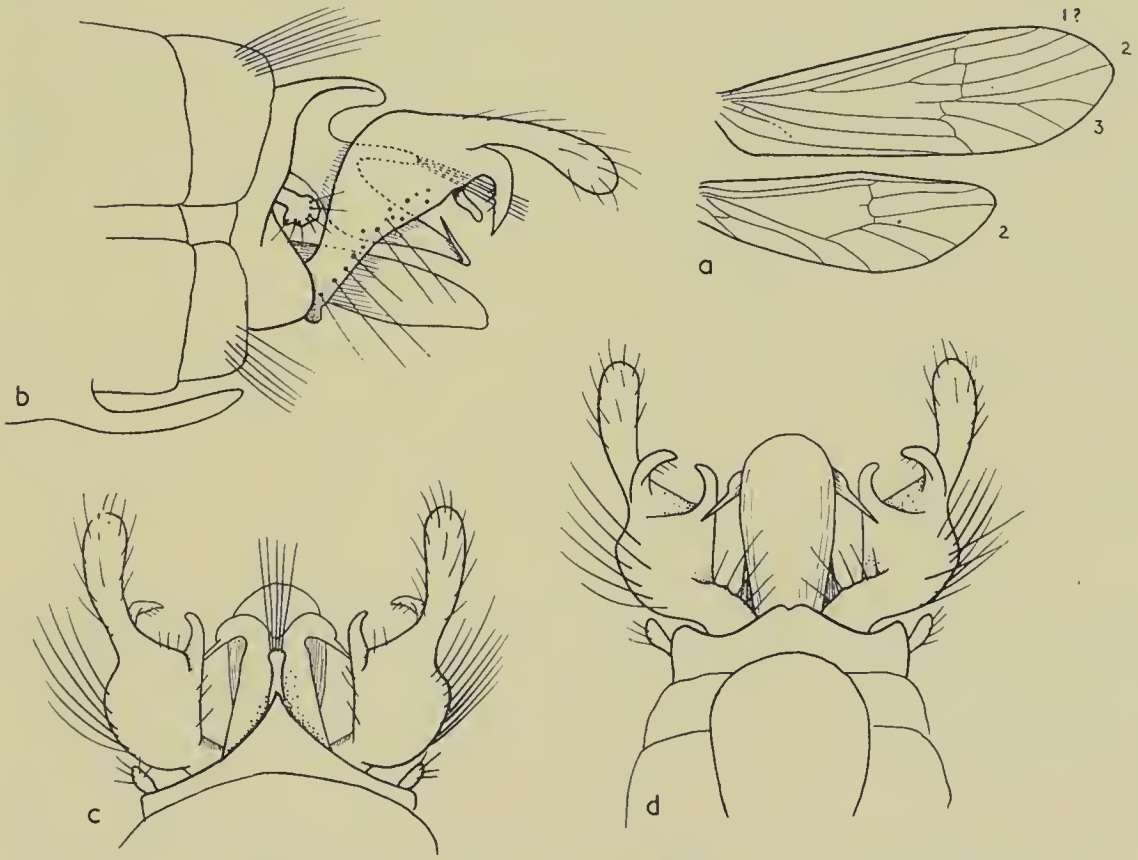

FIG. 100.—*Helicopha hortena* sp. n. ♂. *a*, wings; *b*, genitalia, lateral; *c*, dorsal; *d*, ventral.

margins of the segments and, at the centre, simulate excisions. A darkly-pigmented, lunate pattern appears on the eighth sternite.

Length of the anterior wing, ♂, 6–7 mm. ; ♀, 6 mm.

Tasmania : Hythe, xi.1939, 4 ♂, 1 ♀ ; Mt. Wellington, xii.1939, 4 ♂, J. W. Evans.

Australia : New South Wales, Ebor, 5.i.1914, 1 ♂, R. J. Tillyard.

Type ♂ (Hythe).

The ♂ from Mt. Wellington has the anterior wing 6 mm. long.

Helicopha hortena sp. n. (fig. 100).

Insect yellowish with the wings covered with yellowish pubescence ; neuration scarcely differing from that of *H. astia*.

Genitalia, ♂.—From above, the margin of the ninth segment is reduced to a narrow band, the centre of which is produced in a narrow, acute triangle ; superior appendages short. Beyond the margin of the segment can be seen the upper penis-cover, which is formed of a slender finger, armed at the apex with five or six long bristles, arising from a plate with a bifurcate apex, each fork bent abruptly outward and slightly basally, terminating in a very long, stout spine. Penis lies closely below this plate and is rather wide. Inferior appendages large ; from beneath, each is dilated about midway, where there is a pair of pointed, opposing claws arising from the lateral margins and inturned ; from the side the outer claw is strongly downturned and appears larger than the inner which is out-turned ; beyond these, the appendage is produced in a narrow stem terminating in a dilated apex. The distal margin of the ninth segment, from beneath, is produced at its centre and slightly excised. An exceptionally broad and large spatulate process to the seventh sternite. The abdomen is unusually clothed with long hairs.

Length of the anterior wing, ♂, 5·5 mm.

Australia : New South Wales, Wentworth Falls, 24.ii.1916, 1 ♂, R. J. Tillyard, abdomen mounted in balsam.

This species may be separated from the type species by its broad, spatulate process to the seventh segment.

8. Fam. **ODONTOCERIDAE** Wallengren.

Wallengren, 1891, *Svensk. Ak. Handl.*, **24** (10) : 12.
Ulmer, 1907, *Gen. Insect.*, **60a** : 122.

Spurs (in Australian genera) 2, 2, 4 or 2, 4, 4. *Ocelli* wanting. *Maxillary palpi* long and stout, five-jointed, proportions varying in the different genera. *Antennae* much longer than the wings, basal joint large. Neuration of the male tends to be irregular, often differing from that in the female. In *anterior wing* apical forks nos. 1, 2, 3 and 5 or 1 and 5 present in the male, nos. 1, 2, 3 and 5 in the female ; in *posterior wing* nos. 1, 2, 3 and 5, or 1, 2 and 5, or 1 and 2 or 1 only in the male, nos. 1, 2 and 5, or 5 only in the known females. Discoidal cell present and closed in both wings. Radius sometimes running into the first apical sector. Median cell wanting.

Key to Australian Genera of *Odontoceridae*.

1. Spurs 2, 2, 4 . . . . . *Caloca* gen. n. (p. 153).
–. Spurs 2, 4, 4 . . . . . 2.
2. Basal joint of maxillary palpi much shorter than succeeding joints *Barynema* Banks (p. 161).
–. Basal joint of maxillary palpi as long as second or fourth joint . . . 3.
3. Radius in anterior wing runs into first apical sector . *Marilia* Fr. Müller (p. 164).
–. Radius in anterior wing terminates in wing margin *Atriplectides* Mosely (p. 167).

Caloca gen. n.

Ocelli wanting. Scent-organs present in the ♂, arising from the back of the head as in *Hydroptila*. They consist of two or more extensile filaments clothed with silky hairs at their bases ; these gather into a tuft when the organ is only partly extruded or withdrawn. *Antenna* with a long basal joint bearing a small branch thickly covered with a mass of hair. *Maxillary palpi* with the second, third and fourth joints approximately equal, the basal and terminal joints slightly shorter ; labial palpi, basal joint short, second and third each about twice its length. *Wings :* anterior, in the ♂, with forks nos. 1, 2, 3 and 5 present ; in the posterior, forks nos. 1 and 2 are present in all species examined.* In *straminea* some examples have, in addition, fork no. 5 aberrantly present, sometimes on one side only. In *eba*, *fallia* and *tertia* fork no. 5 is present in this wing. Fork no. 5 is also present in the female examples of *straminea*, and it is possible that this fork will be found in the posterior wings of females throughout the genus. No ventral process. *Spurs* 2, 2, 4.

Type species.—*Caloca straminea* sp. n.

This genus differs from the other Australian *Odontoceridae* in the presence of only 2 spurs on the middle tibiae.

Key to Species of *Caloca*, Males.

1. Dorsal plate from above about as long as broad, the lateral margins triangularly produced . . . . . *C. straminea* sp. n. (p. 153).
–. Dorsal plate from above much longer than broad . . . . . 2.
2. Dorsal plate with only a short apical excision, and armed with about twenty spines . . . . . *C. tertia* sp. n. (p. 156).
–. Dorsal plate exeised almost to its base, and armed with about eight spines . 3.
3. Dorsal plate about as long as superior appendages . . *C. eba* sp. n. (p. 158).
–. Dorsal plate nearly twice as long as superior appendages . *C. fallia* sp. n. (p. 158).

Caloca straminea sp. n. (figs. 101–103).

Insect brownish with sandy-brown *wings*. Fork no. 5 aberrantly and only occasionally present in the posterior wing in the ♂, though regularly present in the ♀. Scent-organ (when partly withdrawn) shows, in the aperture containing it, a mass of golden-yellow hair ; when withdrawn, the cavity enclosing it is closed by a pair of white membranes drawn across from the sides and meeting in the centre. When boiled in caustic potash four filaments are extruded as in *Hydroptila sparsa*, though in this species the filaments are

* In figs. 101, 104–6 the numbering of fork no. 2 in the posterior wing has been unintentionally omitted.

everted, whereas in the genus *Caloca* they appear to be extruded. In dried examples only two filaments are visible.

Genitalia, ♂.—From above, margin of the eighth tergite pigmented to simulate a triangular projection at its centre, on each side of which are long, stiff hairs. The ninth segment (which is transparent above) is produced in a large and broad upper penis-cover whose sides, midway, are produced laterally in short, triangular processes each armed, towards the apex on the upper

Fig. 101.—*Caloca straminea* gen. sp. n. ♂. *a*, wings; *b*, head, lateral, showing extruded filaments; *c*, head from above, showing filaments retracted.

surface, with a very strong, basally directed spine; the apex of the cover is cleft. On the under surface, towards the apex, on each fork are two or three strong, downwardly directed spines; from the base of the cover arise a pair of very long, slender spines directed distally. Superior appendages long and stick-like. Penis straight. Inferior appendages, from the side, arise from a narrow stem and broaden towards the apex, whose margin is truncate with the two angles produced to form inturned claws; from beneath, the ventral margins of the appendages show a small, triangular projection where they meet.

♀. In the example described there is an aberrant discoidal cell in the posterior wing (not figured).

Genitalia.—Two small, finger-like processes arise from just below the terminal segment ; below each of these is a rounded plate ; below these plates is a segment with a cleft distal margin, and below this is a cleft plate whose inner angles are rounded, the outer folded under ; this may form part of the

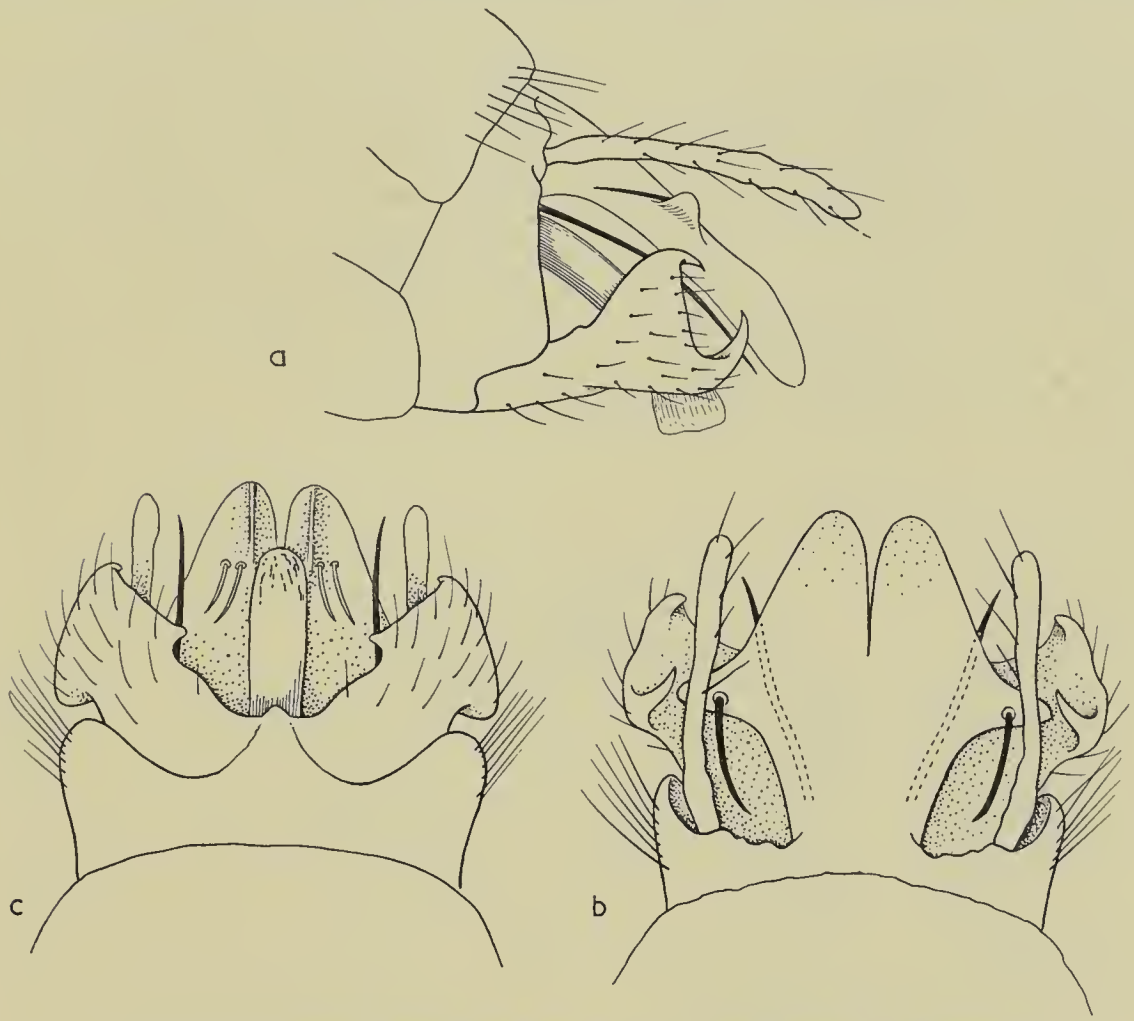

Fig. 102.—*Caloca straminea* gen. sp. n. ♂ genitalia. *a*, lateral ; *b*, dorsal ; *c*, ventral.

vagina. In the cleared examples there are various other structures which are no doubt also part of the vagina and are shown in the figures.

Length of the anterior wing, ♂ and ♀, 6·5 mm.

Australia : New South Wales, Hampton, i. 1918, 9 ♂, 4 ♀, R. J. Tillyard.

Type mounted in canada balsam.

The males of this species may be distinguished from others described here by the wide, triangularly produced dorsal plate. This species agrees with *tertia* in having definitely branched inferior appendages.

Caloca tertia sp. n. (fig. 104).

Insect brown with dark brown wings. The type of this species, a male, is a pinned example of which the head has not been cleared in caustic potash. It is not therefore possible to give a detailed description of the scent-organ.

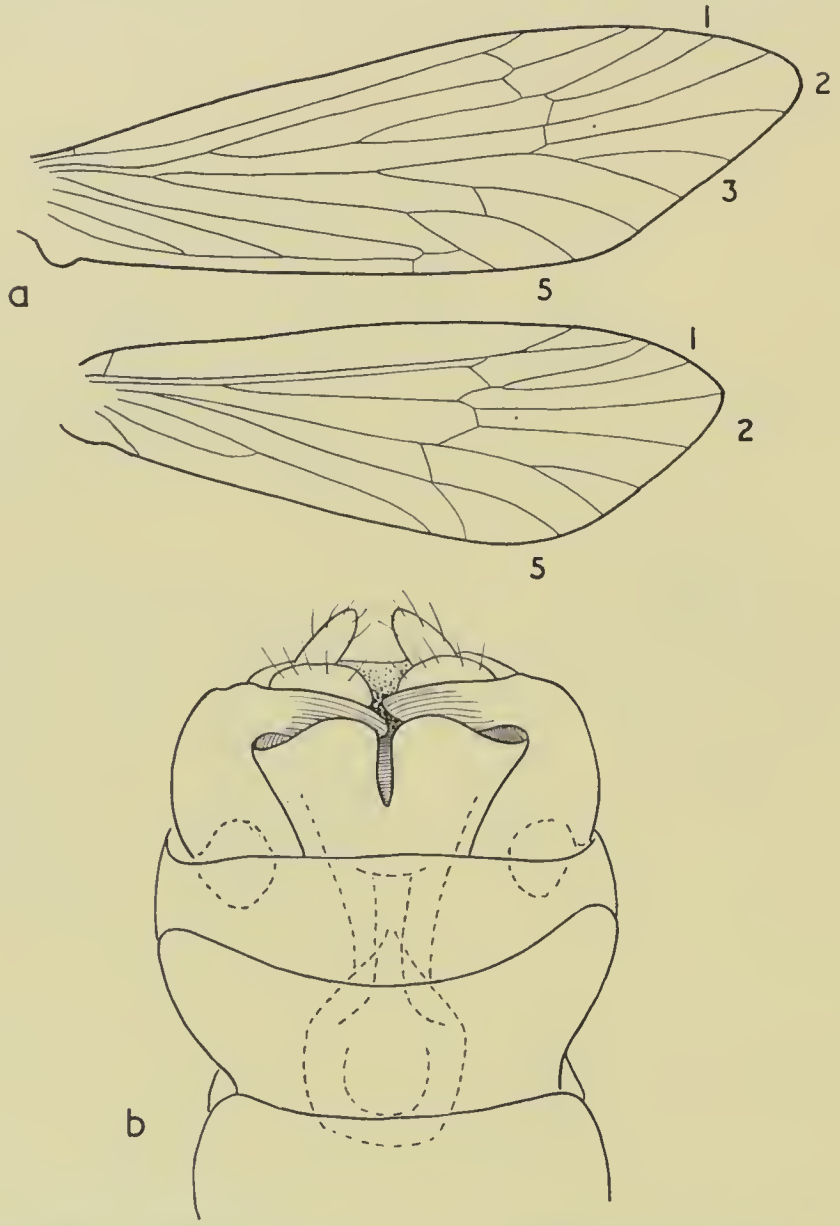

Fig. 103.—*Caloca straminea* gen. sp. n. ♀. *a*, wings ; *b*, genitalia, ventral.

All that may be seen is a pair of tufts of yellow hair just protruding from between the enclosing membrane. In the *posterior wing* fork no. 5 is present. In this wing there is a shallow groove along the centre in which may be seen some broadened hairs differing in pattern and rather darker in colour than those covering the rest of the wing. Neuration as figured.

FIG. 104.—*Caloca tertia* sp. n. ♂. *a*, wings ; *b*, genitalia, lateral ; *c*, dorsal ; *d*, inferior appendage, dorsal, showing inturned braneh ; *e*, genitalia, ventral, upper penis-eover omitted ; *f*, penis, ventral.

Genitalia, ♂.—From above, the margin of the eighth tergite is pigmented to simulate at its centre a triangular projection ; the distal area is beset with long hairs. Ninth segment membranous above, with the distal margin produced in a large upper penis-cover, apex cleft, and furnished at the sides with long, stout spines, some directed laterally and distally and one or two downwards ; superior appendages long and stick-like. Penis straight with the apex sagittate. From the side, the wings of the arrow-head are triangular and downwardly directed. Inferior appendages branched. From beneath, they arise from a wide base with the inner branches sinuate, much longer than the outer, which are short, curving inwards and terminating in bifurcate apices which are only to be seen in cleared specimens. From the side, the apices of the inner branches are produced and terminate in pointed spurs. Margin of the ninth ventral segment with a triangular projection at its centre.

Length of the anterior wing, ♂, 8 mm.

Tasmania : Mt. Wellington, xii.1937, 1 ♂, J. W. Evans, with abdomen mounted in balsam. The heavily spinose dorsal plate and sagittate penis give good characters for the recognition of this species.

Caloca eba sp. n. (fig. 105).

Insect brownish with brownish wings. In the ♂ there is a scent-organ consisting of a filament which can be extruded to considerable length and which is thickly clothed with hair at its base. *Wings* as figured, fork no. 5 present in the posterior wing.

Genitalia, ♂.—From above, distal margin of the ninth segment produced and triangular. To the margin is welded a long upper penis-cover, narrow, parallel-sided and cleft to the base, but with the two parts perhaps welded together for the lower third. The cover bears at the apex of each fork four long, peg-like spines, but in the example described it is apparent that on each fork one of the spines has been lost. Superior appendages very long, stick-like. Penis arched. Inferior appendages broad at the base narrowing to calliper-like terminations ; base of the appendages and the margin of the ninth segment bearing long, stiff hairs.

Length of the anterior wing, ♂, 5 mm.

Australia : New South Wales : Ebor, 5.i.1914, 3 ♂, 4.ii.1915, 3 ♂ ; Stanwell Park, 15.iv.1916, 1 ♂, R. J. Tillyard.

Type ♂, mounted in balsam, from Ebor, 4.ii.1915.

This species and *C. fallia* are closely related in the narrow, deeply excised dorsal plate. In *eba* the spines are concentrated at the apex, and the dorsal plate is not longer than the superior appendages, whereas in *fallia* the spines are longer, more dispersed, and the dorsal plate is nearly twice as long as the superior appendages.

Caloca fallia sp. n. (fig. 106).

Insect and wings fulvous with paler pubescence. *Neuration* very similar to that of the other species in the genus but differing slightly in detail. Scent-

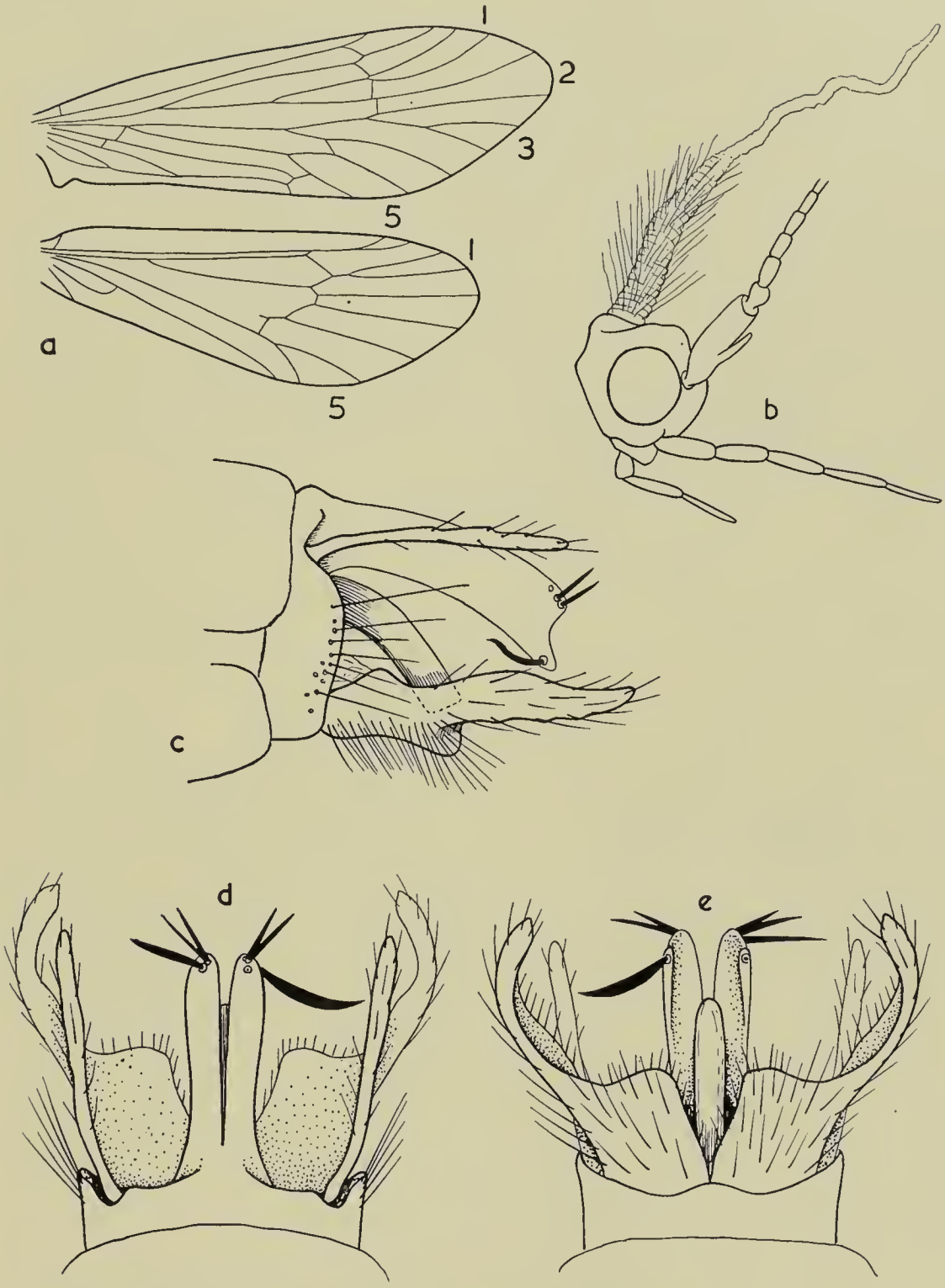

FIG. 105.—*Caloca eba* sp. n. ♂. *a*, wings ; *b*, genitalia, lateral ; *c*, dorsal ; *d*, ventral.

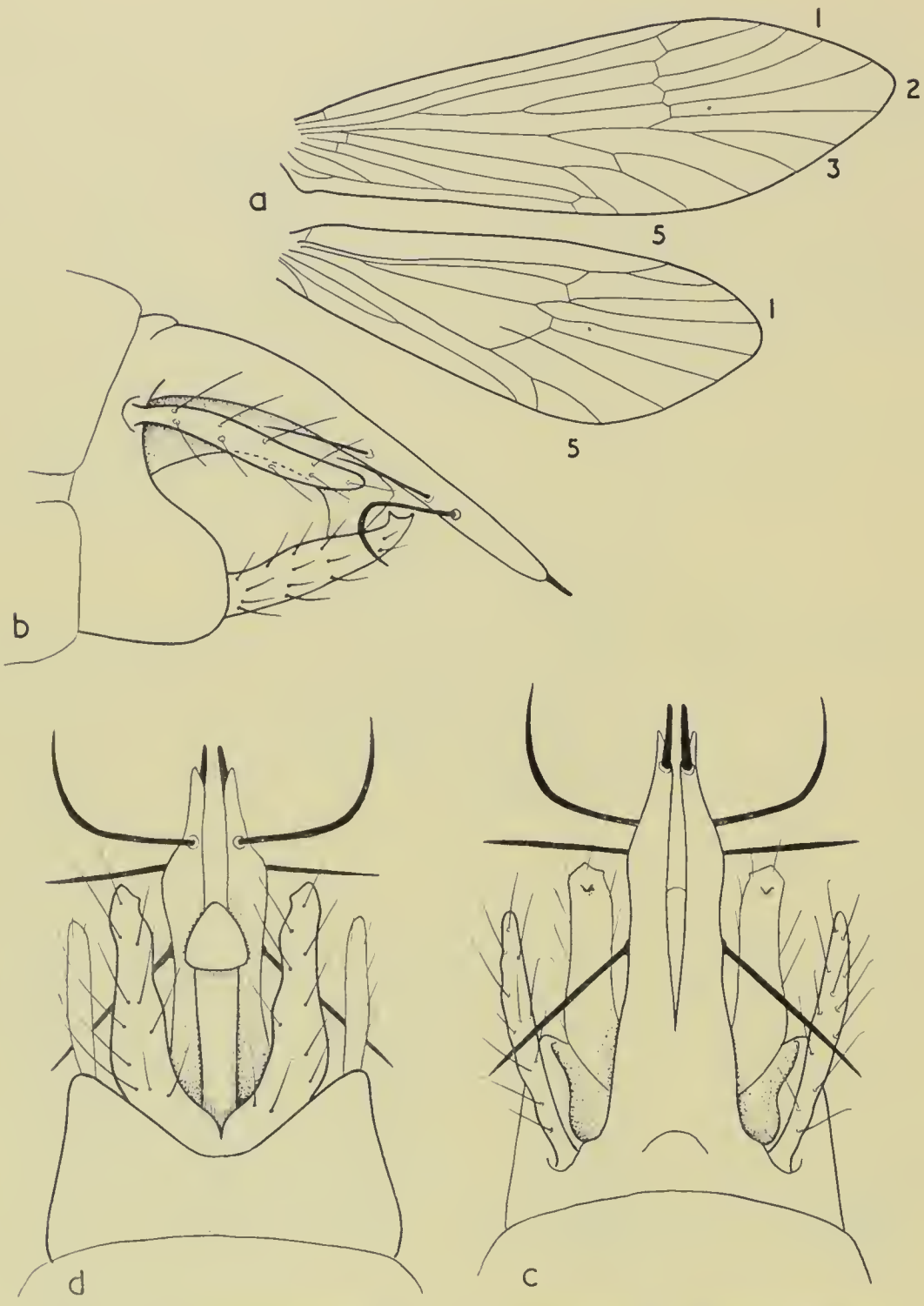

FIG. 106.—*Caloca fallia* sp. n. ♂. *a*, wings; *b*, genitalia, lateral; *c*, dorsal; *d*, ventral.

organ : the head has not been treated with KOH so that no full description of the scent-organ can be made. The cavity containing the organ is uncovered and the thick clusters of yellow hairs can be seen within.

Genitalia, ♂.—From above, distal margin of the ninth segment produced at its centre in a small triangle. To the margin is welded a long upper penis-cover, narrow, parallel-sided and cleft nearly to the base. Each fork bears a strongly chitinized spine arising shortly before the apex ; also shortly before the apex is a pair of spines, one on each side, arising on the underside of the cover and bent at right-angles halfway so that the apex is directed distally. Slightly nearer the base is another pair of long spines directed outward ; still nearer the base is a third pair directed basally ; these three pairs of spines are longer and thinner than the apical pair. Superior appendages long and stick-shaped. Penis fairly long and arched. Inferior appendages narrow with sinuate margins directed slightly upward, from the side, apices excised. Ninth ventral segment with a clear patch free from pigmentation to simulate a deep excision at its centre ; the sides of the segment are strongly produced at the bases of the inferior appendages.

Length of the anterior wing, ♂, 6·5 mm.

AUSTRALIA : New South Wales : Wentworth Falls, 18.xi.1921, 2 ♂, R. J. Tillyard.

Type ♂, with abdomen mounted in balsam.

The differences between this species and *C. eba* have been noted under that species.

Barynema Banks.

Barynema Banks, 1939, *Bull. Mus. Comp. Zool. Harv.*, **85** : 483.

[*Ocelli* absent. *Spurs* 2, 4, 4. *Antenna* with a long basal joint, as long as the width of the head between the oculi ; second joint short, shorter than each of the succeeding joints. *Maxillary palpi* five-jointed ; basal joint very short ; all the other joints about three times its length and sub-equal. Radius terminates in the first apical sector in both wings ; often also a cross-vein between radius and first apical sector. Apical forks nos. 1, 2, 3 and 5 present in both wings.

Type species.—*Barynema costatum* Banks, 1939.

Banks describes this genus as similar to *Ganonema*, but since his figure of the anterior wing shows the median cell to be absent, the genus must be transferred from the *Calamoceratidae* to the *Odontoceridae*. A female example which agrees well with Banks' description of the general appearance has been provisionally placed as *B. costatum* Bks. There are some minor differences in venation, there being a cross-vein between the radius and the first apical sector a little beyond the discoidal cell in both wings. These cross-veins are not easy to see in the undenuded wing, and it is quite possible that they have been overlooked in the wing of the male of *B. costatum*.

Mr. Mosely had originally intended to erect a new genus for his new species *australicum*, but the general similarity between the two species, coupled with

the discovery that *Barynema* had been incorrectly placed, has led me to withdraw his generic name in favour of *Barynema*.—D. E. K.]

Barynema costatum Banks (fig. 107).

Barynema costatum Banks, 1939, *Bull. Mus. Comp. Zool. Harv.*, 85 : 484, figs. 43, 51, 54.

Banks describes the species as follows :

" Head black ; thorax shining black above ; abdomen dull black ; antennae and palpi blackish, unmarked except basal joint of antennae is a little paler ; legs blackish, spurs brown. Wings blackish, being densely clothed with black hair ; fore wings with a stripe of golden hair along anal vein, fully halfway to end of vein, and a curved pale band over the anastomosis, but not reaching to either margin ; in front the band has mostly white hair, but behind it is almost wholly yellowish ; the cross-vein to end of anal is hyaline white ; hind wings unmarked. In fore wings the venation as figured, costal margin thickened ; forks one and two both sessile on discal cell, fork three shorter and pedicellate, anal apparently runs into fork of cubitus or an oblique cross-vein from cubitus ; in hind wings discal cell plainly closed, fork one back a short distance on cell, fork two reaches the cell, fork three pedicellate, fork five fairly long.

" Male genitalia show above a pair of elongate tapering superior appendages, below is a shorter upturned pair of interior [inferior ?—M.E.M.] appendages and projecting between is a stout, blunt penis.

" Fore wing, 9·5 mm. long.

" From Mt. Donna Buang, Victoria, Australia, 6, 7 Dec. (Darlington)."

Type in the Museum of Comparative Zoology, Harvard College, U.S.A.

[A female from the Tillyard Collection, New South Wales, Stanwell Park, 15.iv.1916, is provisionally referred to the species. It lacks the white hairs in front of the curved band over the anastomosis.—D. E. K.]

Barynema australicum sp. n. (figs. 108, 109).

Insect and wings fulvous, post-costal area yellowish.

Genitalia, ♂.—From above, the distal margin of the ninth dorsal segment is produced in a small triangle. Superior appendages very long, extending beyond the rest of the genitalia, from above, broad, tapering to acute apices. Upper penis-cover large with two short processes arising at the base, directed upward, apices set with short hairs ; beyond these processes the cover extends in a large, cleft plate with angular lateral projections towards the apex and with its upper surface bearing groups of thorn-like spines. From the side the apex is truncate, with a very slightly produced upper angle ; the margin and outer surface is set with short, strong spines. Penis straight. Inferior appendages with a broad basal part, from the side, terminating in a rounded apex arising from a short neck and with the inner surface covered with black teeth ; no ventral process.

Length of the anterior wing, ♂, 7·5 mm.

Australia : New South Wales, Ebor, 5.i.1916, 1 ♂, R. J. Tillyard, with the head and abdomen mounted in balsam.

This species differs from *B. costatum* in the absence of the yellow lunate

mark over the anastomosis in the anterior wing, its lighter colouring and the different form of the male genitalia.

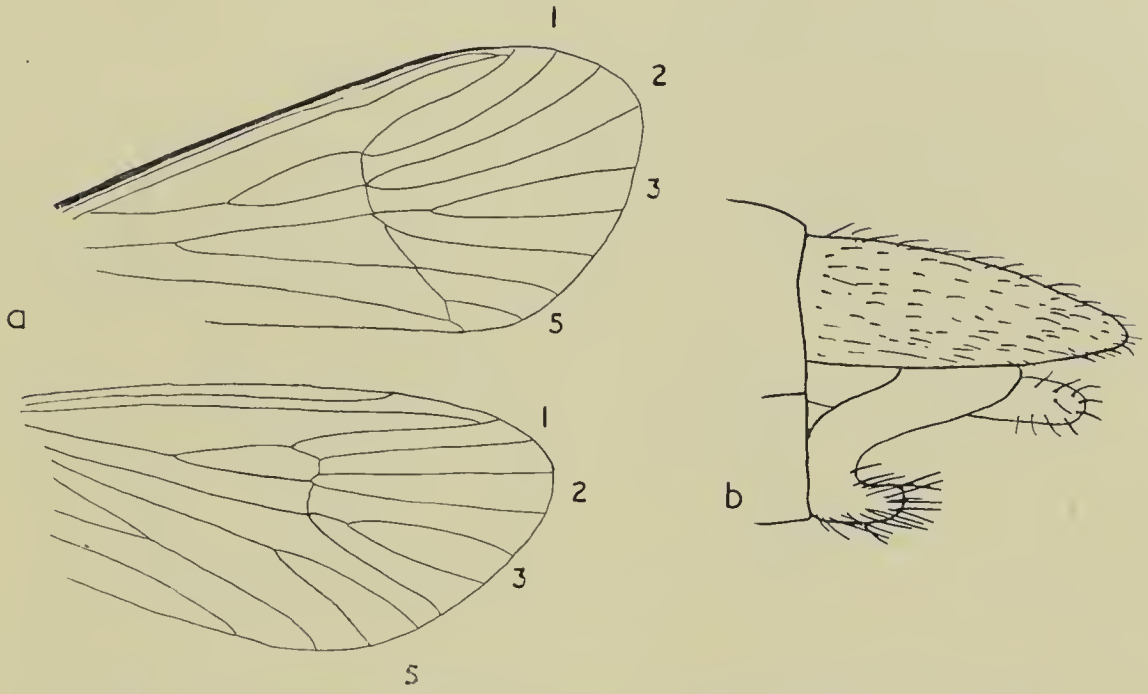

Fig. 107.—*Barynema costatum* Banks. ♂ (after Banks). *a*, wings; *b*, genitalia, lateral.

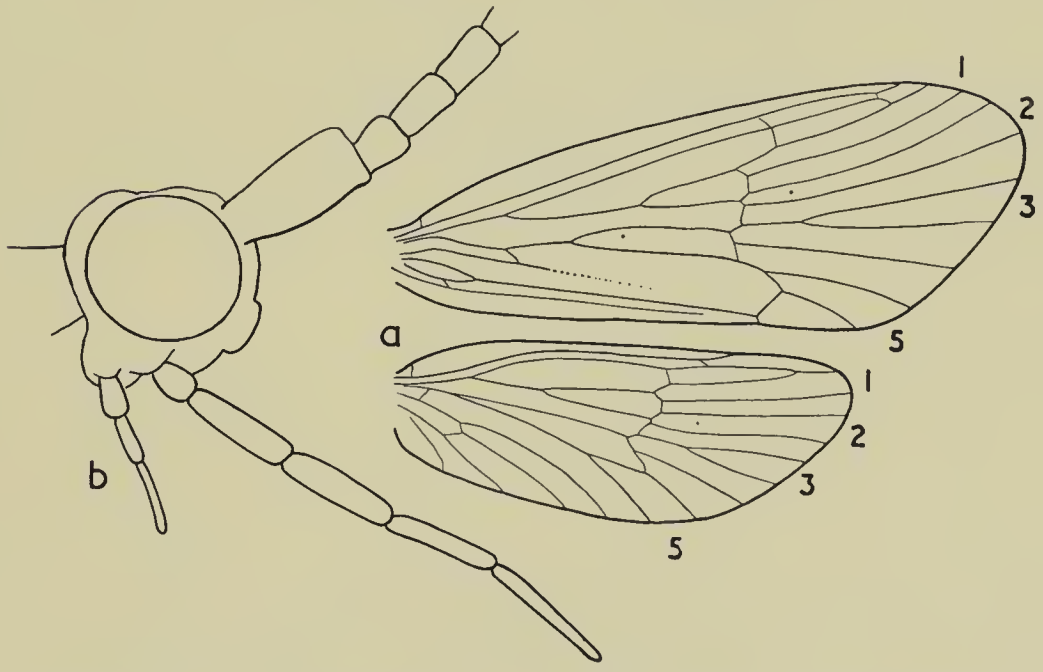

Fig. 108.—*Barynema australicum* sp. n. ♂. *a*, wings; *b*, head, lateral.

Marilia Fr. Müller.

Fr. Müller, 1878, *Arch. Mus. Nac. Rio de Janeiro*, **3** : 127.
Ulmer, 1905, *Stett. ent. Zeit.*, **1905** : 23.
,, 1907, *Gen. Insect.*, **60a** : 127.
,, 1913, *Deutsch. ent. Z.*, **4** : 401.

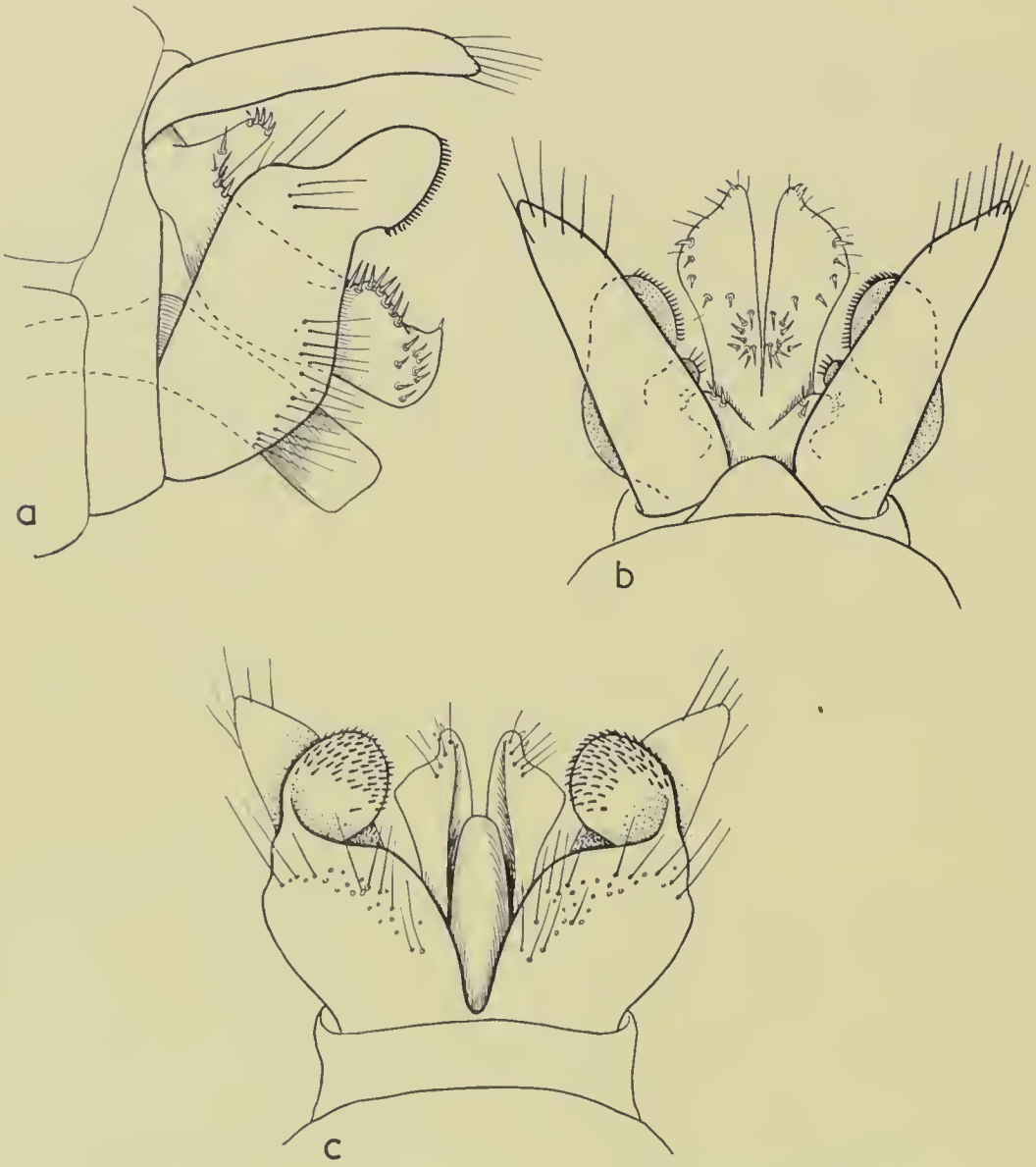

Fig. 109.—*Barynema australicum* sp. n. ♂ genitalia. *a*, lateral ; *b*, dorsal ; *c*, ventral.

Spurs (in Australian species) 2, 4, 4 ; pre-apical spurs of middle tibia arise at end of basal third of tibia. *Eyes* of male large, often almost touching. *Antenna* slender, more than twice as long as fore wing ; basal joint stout, about as long as head. *Maxillary palpi* slender, densely hairy ; proportions of the joints variable ; labial palpi very short. *Fore wing* long, rather narrow

at base, towards the apex more or less dilated. Hind wing sometimes very broad, fan-like in male. Both wings with dense pubescence ; discoidal cell closed. Neuration rather reduced in male ; forks nos. 1, 2 and 5 in anterior, probably only no. 1 in posterior wing. In anterior wing the media is apparently fused with Cu_1 as far as the anastomosis, consequently the thyridial cell is absent. Cu_1 widely spaced from Cu_2, these two veins and 1A more or less parallel, 1A with a row of wing-coupling bristles. In posterior wing, M_{3+4} runs into Cu_1 towards the apex. In the female (at least in the Australian species) the neuration is normal, forks nos. 1, 2, 3 and 5, the thyridial cell present in the fore wing, forks nos. 1, 2 and 5 in posterior wing. M_{3+4} does not run into Cu_1 in this wing.

Type species (here designated).—*Marilia major* Fr. Müller, 1878.

Key to Species of *Marilia*, Males.

1. Colour pale fuscous ; eyes large, globose, almost touching on the vertex
M. bola sp. n. (p. 165).
–. Colour reddish fuscous ; eyes separated on vertex by about the width of an eye
M. fusca sp. n. (p. 167).

Marilia bola sp. n. (figs. 110, 111).

♂. [*Head* dark fuscous, with whitish hairs. Eyes large, globose, almost touching on the vertex. *Antennae* fuscous, with whitish annulations. *Maxillary palpi* fuscous, with fuscous hairs ; first, second and fourth joints about equal, third slightly longer and fifth rather shorter than first. *Thorax* and *legs* fuscous, with whitish hairs. *Wings* pale fuscous, with pale fuscous pubescence, anterior also with a sprinkling of white hairs, a patch of white hairs from arculus over base of fork no. 5, and other patches in the apical cellules. Anal lobe of posterior wing with a small pencil of long hairs.—D. E. K.]

Neuration as figured.

Genitalia, ♂.—From above, apical margin of the ninth segment apparently produced at its centre in a large, slender spike which is actually the upper margin of a deep dorsal plate which is cleft from beneath. Superior appendages short ; penis short. Inferior appendages two-jointed ; basal joint stout and darkly pigmented ; terminal joint short, transparent ; lateral margin of the ninth segment scooped out at the insertion of the superior appendages.

Genitalia, ♀.—From above, the abdomen terminates in two triangular processes, joined at their apices by a plate with a pigmented centre whose distal margin is straight ; beneath this process are two, rounded plates.

Length of the anterior wings, ♂ and ♀, 8·5 mm.

Australia : New South Wales, Ebor, 12.i.1916, 2 ♂, Bolaro, 25.xii.1935, 1 ♂, 1 ♀, R. J. Tillyard.

Type ♂ (Bolaro) in the form of microscope preparation.

[A single ♂ from Tasmania, Deloraine, 28.xii.1884, is referred here with some doubt. The genitalia do not appear to differ, but the insect is considerably larger (fore wing 11 mm.) and there are slight differences in neuration. —D. E. K.]

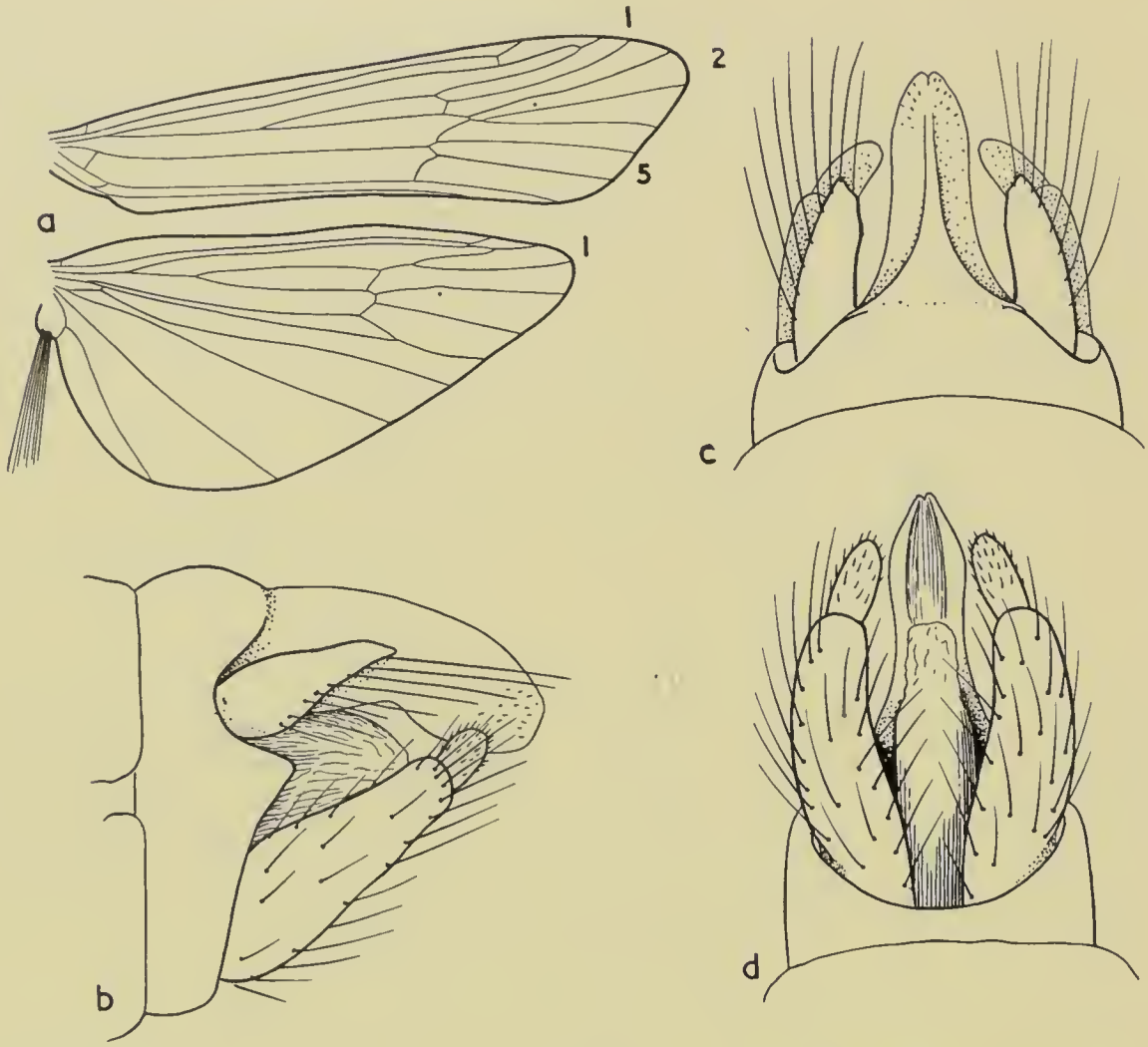

Fig. 110.—*Marilia bola* sp. n. ♂. *a*, wings ; *b*, genitalia, lateral ; *c*, dorsal ; *d*, ventral, superior appendages omitted.

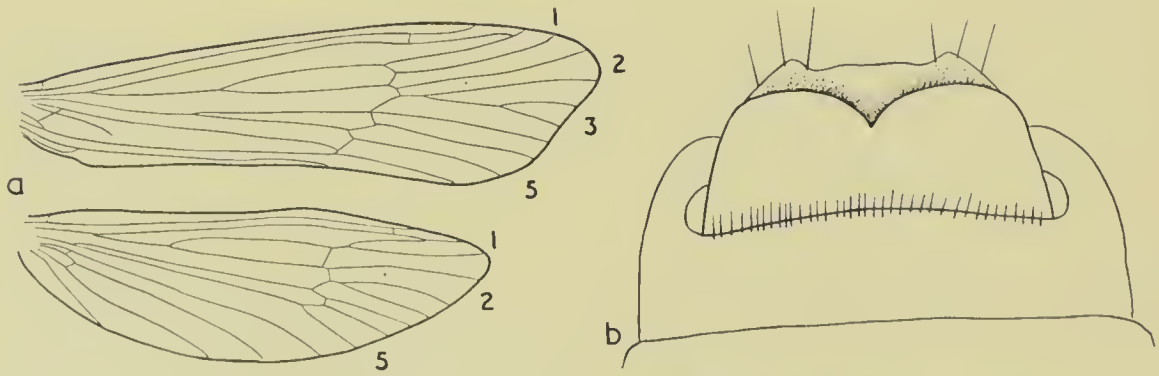

Fig. 111.—*Marilia bola* sp. n. ♀. *a*, wings ; *b*, genitalia, ventral.

Marilia fusca sp. n. (Kimmins) (fig. 112).

General appearance reddish fuscous, with pale creamy antennae and some small patches of creamy yellow hairs on anterior wings.

♂. *Head* fuscous, with sparse fuscous hairs; eyes large, not approximated, but separated by about the width of the eye. *Antennae* fuscous at base, rapidly becoming pale creamy white. *Maxillary palpi* fuscous and hairy, first, second and fourth joints about equal, third slightly longer and fifth a little shorter than first. Labial palpi with the three joints about as long as the basal joint of the maxillary palpi. Thorax dark fuscous, legs pale fuscous, with yellowish pubescence. *Wings* fuscous, with dense reddish fuscous pubescence, the anterior with patches of yellowish hairs in the cubital area, near the anastomosis and in the apical cells. Anterior wing with fork no. 5 extending to about the middle of the discoidal cell, some distance before the origin of M; cross-vein below fork no. 5 rather oblique. Posterior wing with comparatively narrow anal fan; fork no. 1 sessile; discoidal cell a little longer than its footstalk. No pencil of hairs on anal lobe.

Genitalia conforming to the generic pattern. Dorsal margin of ninth segment produced and rounded at its centre. Superior appendages large, elongate-ovate, and fringed. Between them is a deep, hood-like dorsal plate, fused at its base to the margin of the ninth segment; its apical angles produced, enclosing a quadrate excision. In dorsal view each angle resembles a bird's head, with the beak directed outwards. Penis short and stout. Inferior appendages two-jointed. Basal joint long, slightly upcurved, and tapering from a stout base; apical joint small and armed with fine spines or teeth.

Length of anterior wing, ♂♀, 7 mm.

Australia: New South Wales, Epping, 28.iv.1916, 4 ♂, 1 ♀, Wauchope, 23.ii.1917, 1 ♂, R. J. Tillyard.

Type ♂ (Epping). This species may be readily distinguished from *M. bola* by its dark coloration and more widely separated eyes in the male, and by the absence of a pencil of hairs on the anal lobe of the hind wing.

Atriplectides Mosely.

Atriplectides Mosely, 1936, *Trans. R. ent. Soc. Lond.*, **85**: 119–120.

Discoidal cell small in both *wings*. In the anterior, forks nos. 1 and 5 present in the ♂, 1, 3 (?) and 5 in the ♀; apical cells nos. 1 and 4 sessile; the last apical cell very broad, an additional apical cell in the ♀. Discoidal cell narrow, much shorter than its footstalk; in one example examined the neuration is aberrant so that a cell is present simulating a median cellule. In the posterior wing fork no. 5 only is present in both sexes; all the other apical cellules sessile. Discoidal cell short, shorter and broader than that in the anterior wing. *Spurs* 2, 4, 4. Inferior appendages in the male two-jointed.

Type species.—*Atriplectides dubia* Mosely, 1936.

The genus was described originally in the *Leptoceridae*, subfamily *Triplectidinae*. It is here transferred to the *Odontoceridae*, the characters of the single species, *dubia*, conforming better with those in this family.

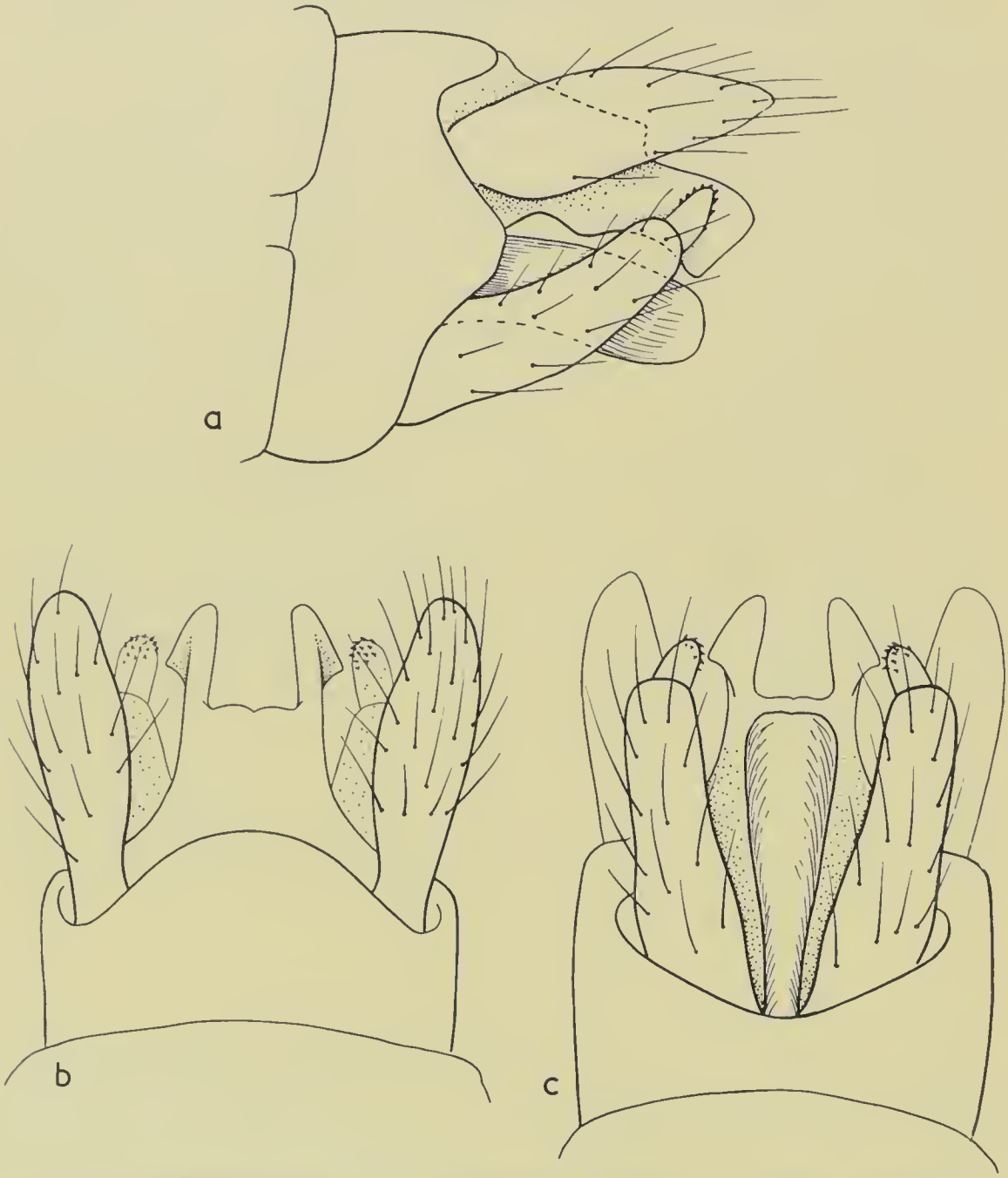

Fig. 112.—*Marilia fusca* sp. n. ♂ genitalia. *a*, lateral ; *b*, dorsal ; *c*, ventral.

Atriplectides dubia Mosely (figs. 113–114).

Atriplectides dubia Mosely, 1936, *Trans. R. ent. Soc. Lond.*, 85 : 120–121, figs. 84–90.

Head dark with dark greyish to fuscous pubescence. Oculi nearly black ; *palpi* dark fuscous ; *antennae* fuscous with paler annulations. *Wings* dark

fuscous with dark hairs which are inclined to group and form nearly black spots. Fringe darker, so that there is a nearly black border to the wings.

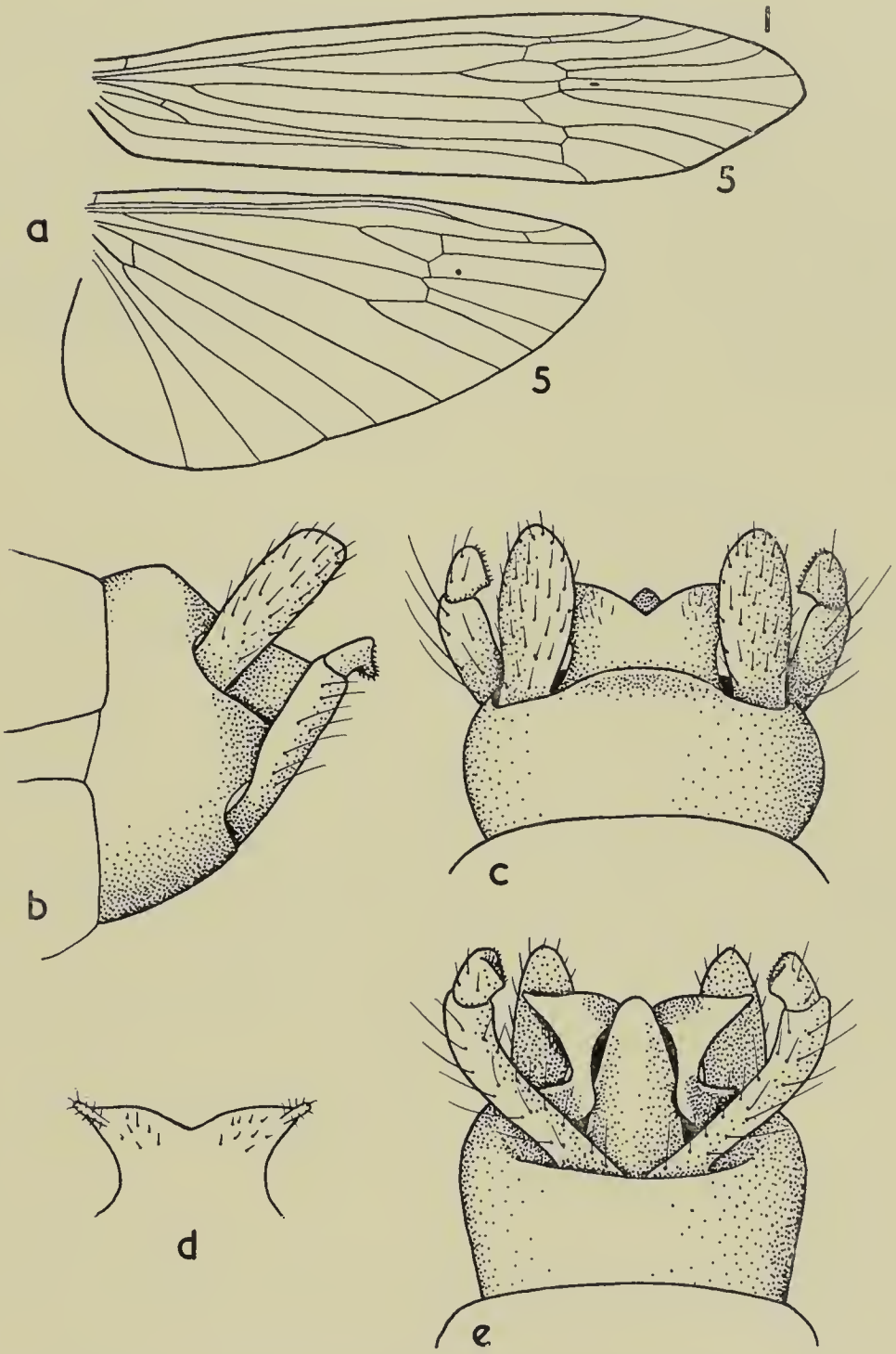

FIG. 113.—*Atriplectides dubia* Mosely. ♂. *a*, wings ; *b*, genitalia, lateral ; *c*, dorsal ; *d*, upper penis-cover, dorsal ; *e*, genitalia, ventral.

Anterior *legs* with dark spurs; other legs pale fuscous, closely covered with cream-coloured hairs ; spurs cream-coloured.

Genitalia, ♂.—From above, the margin of the ninth tergite is produced downward to meet the upper penis-cover. From the side there is a triangular projection of the distal margin. Superior appendages widely separated, short, with subacute apices. Upper penis-cover very wide, with excised apical margin and widely extended apical angles each with a small serrate ridge on its upper surface at the extreme apex ; two small processes, inwardly directed, on the ventral side, one on each side of the excision. Penis about as long as its upper cover, apex projecting in the angle of the excision. Inferior appendages unbranched and two-jointed. Basal joint long with nearly parallel margins from beneath, but slightly constricted at the base from the side. Terminal joint very short ; apex truncate with a serrate ridge on its lower surface which, from the side, projects to make a downwardly pointing lower apical angle.

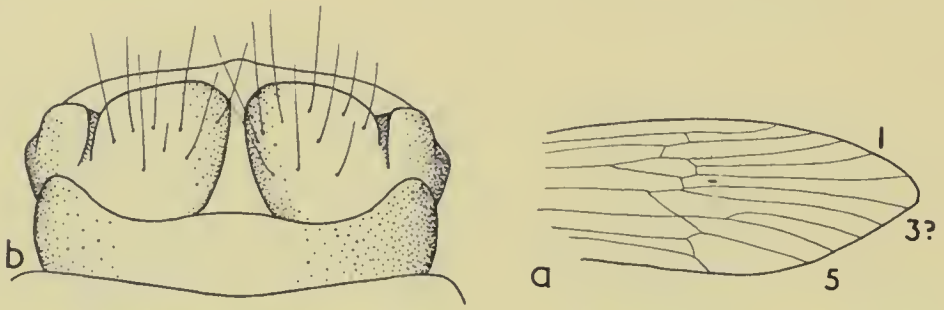

Fig. 114.—*Atriplectides dubia* Mosely. ♀. *a*, apex of anterior wing ; *b*, genitalia, dorsal.

Genitalia, ♀.—Seen from above and slightly from behind, there are two pairs of lobes, the inner large and rounded, the outer small and oval. Margin of the terminal dorsal segment produced towards the edges.

Length of the anterior wing, ♂, 12 mm. ; ♀, 13 mm.

Tasmania : Great Lake, Miena, i.1931, xi.1933, ii.1934 ; Penstock, i.1931, C. Parker ; Cradle Mt., 16–21.i.1917 ; Hobart, 29.i.1917 (Tillyard Coll.) ; Deloraine, 25.xii.1884 (McLachlan Coll.).

9. Fam. **CALAMOCERATIDAE** Ulmer.

Ulmer, 1906, *Notes Leyd. Mus.*, **28** : 106.
,, 1907, *Gen. Insect.*, **60a** : 112.

Spurs generally 2, 4, 4, sometimes 2, 4, 3 or 2, 4, 2 ; spurs of anterior tibia short, on the other legs the inner spurs much longer than the outer. *Antennae* longer than fore wing ; first joint thick, not longer than the head. *Ocelli* absent. *Maxillary palpi* five- or six-jointed, hairy, the last joint not articulated. *Anterior wing* generally broad, strongly dilated apically, somewhat triangular. Discoidal cell always closed ; median cell and a basally extended

thyridial cell always present and closed. Forks nos. 1, 2, 3, 4 and 5 present in both sexes ; neuration alike in the sexes ; radius in the hind wing always, and generally also in the fore wing, running into the first apical sector. Fore wing generally thickly hairy, generally unicolorous, dark, occasionally with definite markings or pattern. *Hind wing* much shorter than fore wing, often narrower. Forks 1, 2, 3 and 5 generally present ; discoidal cell open or closed ; median cell open.

Genitalia of the male with large superior appendages, a somewhat flattened or dilated dorsal plate, simple penis without sheaths, and variable inferior appendages.

The genus *Barynema* Banks having been removed to the *Odontoceridae* (p. 161), there remains only the genus *Anisocentropus* McLachlan so far recorded from this region.

Anisocentropus McLachlan.

Anisocentropus McLachlan, 1863, *Trans. ent. Soc. Lond.*, (3) 5 : 492.
Anisocentropus Ulmer, 1907, *Gen. Insect.*, 60a : 118.
Anisocentropus Ulmer, 1929, *Deutsch. ent. Zeitschr.*, 1929 : 167–172, fig. 8.

McLachlan describes the genus as follows :

" Head convex above, ocelli absent ; antennae about twice the length of the wings, thread-like ; basal joint short, bulbous, a tuft of hairs is placed on the underside between the basal joint and the eye ; maxillary palpi very long, hairy, not differing in the sexes ; 1st and 2nd joints short, of equal length, 3rd longer than the 1st and 2nd united, 4th half the length of the 3rd, terminal joint about as long as the 3rd, flexible ; labial palpi small, the joints of about equal length.

" Prothorax small, much narrower than the head ; mesothorax oval-elongate, broader than the head and flattened above ; abdomen not robust.

" Legs : femora thin, sub-compressed ; tibiae cylindrical, the posterior tibiae and tarsi always more or less hairy. Spurs 2, 4, 3 ; anterior tibiae with two small spurs at the apex ; intermediate tibiae with two spurs at the apex and two in the middle, the outer spurs in each pair long ; posterior tibiae with one long spur in the middle and two unequal ones at the apex.

" Wings rather thickly clothed with short adpressed pubescence : anterior wings short and broad, dilated at the apex, which is obliquely rounded ; discoidal cell closed ; anastomosis complete, but very irregular ; the two apical cells formed by the furcation of the two branches of the *ramus discoidalis*, very long ; posterior wings much smaller than the anterior, folded."

Type species (by designation of Ulmer, 1929).—*Anisocentropus illustris* McLachlan, 1863.

It should be added that the maxillary palpi are six-jointed, the terminal joint being very short. [The cross-vein closing the discoidal cell in the hind wing, shown in McLachan's figure (1863) of *Anisocentropus illustris* (venation), appears to have been an error on the part of his artist, the discoidal cell being actually open, as in the shaded figure of this species.—D. E. K.]

With so few species involved, a key to the Australian species of this genus appears unnecessary.

Tillyard (1926, *Ins. Austral. N.Z.*, p. 392) reports that species of the genus *Anisocentropus* occur in the neighbourhood of still or slowly-moving water.

Anisocentropus latifascia (Walker) (figs. 115–116).

Notidobia latifascia Walker, 1852, *Cat. Neur. Ins. B.M.* **1** : 90.
Goera elegans Walker, 1852, *op. cit.* : 95.
Leptocerus elegans Hagen, 1861, *Syn. Neur. N. Amer.* : 279.
Leptocerus latifascia Hagen, 1861, op. cit. : 279.
Leptocerus latifascia McLachlan, 1863, *Ent. Ann.*, 159, 162.
Anisocentropus latifascia McLachlan, 1863, *Trans. ent. Soc. Lond.*, (3) **1** : 495, pl. 19.
Anisocentropus latifascia Hagen, 1864, *Verh. zool.-bot. Ges. Wien*, **14** : 804.
Anisocentropus flavicaput McLachlan, 1866, *Trans. ent. Soc. Lond.*, (3) **5** : 260. **(Syn. nov.)**
Anisocentropus latifascia Banks, 1892, *Trans. amer. ent. Soc.*, **19** : 366.
Anisocentropus latifascia Ulmer, 1906, *Notes Leyd. Mus.*, **28** : 54.
Anisocentropus flavicaput Ulmer, 1906, op. cit., 54.
Anisocentropus latifascia Ulmer, 1907, *Gen. Ins.*, **60a** : 118.
Anisocentropus flavicaput Ulmer, 1907, op. cit. : 119.
Anisocentropus latifascia Banks, 1907, *Cat. Neur. Ins. U.S.* : 44.
Ganonema bicolorata Martynov, 1913, *Ann. Mus. zool. Acad. Sci.*, **19** : 132. **(Syn. nov.)**.
Anisocentropus flavicaput Ulmer, 1916, *Ark. f. Zool.*, **10** : 16.
Anisocentropus latifascia Ulmer, 1929, *Deutsch. ent. Z.*, : 168.
Anisocentropus flavicaput Ulmer, 1929, op. cit., 168–9, 176, f. 12.
Anisocentropus bicoloratus Ulmer, 1929, op. cit. : 168–9.
Anisocentropus latifascia Betten, 1934, *N.Y. State Mus. Bull.* **292** : 232.
Anisocentropus latifascia Milne, 1936, *Stud. N. Amer. Trich.*, **3** : 61.
Anisocentropus latifascia Betten and Mosely, 1940, *Fr. Walker Types Trich.* : 39.

Walker describes *Notidobia latifascia* as follows :

"*Testaceus, hirtus* ; *antennae articulis fusco cinctis* : *alae anticae fascia lata obliqua fusca, posticae cinereae.*

"Testaceous, clothed with testaceous hairs : antennae slender, longer than the body, or perhaps twice its length ; each joint brown at the base ; 1st joint stout : fore-wings with a broad oblique brown band beyond the middle ; hind-wings gray. Length of the body $2\frac{1}{2}$ lines ; of the wings 9 lines.

"*a*. North America. Presented by the Entomological Club."

To this description Betten and Mosely added :

"*Head*, basal joint of the antenna, palpi, thorax and legs all yellow, heavily clothed with yellow hair ; *antennae* not complete, with broad brown and narrow yellow annulations, the yellow rings becoming narrower distally and almost disappearing at the broken ends ; maxillary palpi distinctly six-jointed ; the hind tibiae and tarsi have some rather long black hairs ; the membrane of the *fore wing* is dark brown, almost completely covered with dense tawny hair ; the broad oblique brown band of the original description shows very indistinctly in the specimen selected as the type ; in the denuded wing, a very distinct pterostigma is shown and the brown band is faintly indicated ; at the anal angle of the hind wing there is a heavy pencil of long hairs ; the *hind wing* shows a striking character which may very likely be generic ; the area immediately posterior to vein Cu_{1a} is clear, contrasting strongly with the brown on either side of it ; the veins Cu_2 and 1st A that normally occupy this area are virtually obliterated.

"The type *elegans* agrees with *latifascia* except that the apical half of the fore

wing is darker than the base and is covered with dark brown hair ; the oblique basal margin of this area is decidedly darker than the apex of the wing and forms the " oblique brown band " of the original description ; the hind wings are brown with brown hairs.

" Length of the fore wing, male, 11 mm.

" *Genitalia*, male.—The ninth tergite is produced in a large plate with a truncate apex, excised slightly at its centre and with the apical angles produced in small, down-turned hooks ; from above there are triangular projections midway along the lateral margins ; towards the centre is a pair of ridges, wide at their bases and tapering to acute apices, separated by a deep furrow ; at the centre of the anterior margin of each tergite is a narrow V-shaped clear space ; superior appendages rather longer than the dorsal plate, apices dilated from above and bearing very

Fig. 115.—*Anisocentropus latifascia* (Walker). × 8¼ (Photo. D. E. K.).

long hairs ; penis thick with a bifurcate inner structure enclosed in a membrane, tapering abruptly to a point, from the side ; inferior appendages somewhat rounded from the side, inner surfaces covered with short teeth ; ninth segment sharply excised about midway along its margin, seen from the side ; deeply and widely excised from beneath.

" The decided difference in general appearance between the types of *latifascia* and *elegans* is in the pubescence rather than in the membrane of the wings. A study of the genitalia leaves no doubt of the specific identity of these specimens. Nor is there any doubt as to the generic position of the species ; the six joints in the maxillary palpus which Ulmer (1929) has shown to be characteristic of *Anisocentropus* are clearly shown.

" The type specimen of *Anisocentropus latifascia* bears neither locality label nor the label of the Entomological Club from which it was received. There is decided doubt that the species is found in North America. Walker indicated this in

the description of *elegans*, but not in the case of *latifascia*. A third specimen in the British Museum, bearing the label "Nat. Mus. Victoria," agrees with the other two, and Ulmer records that he found specimens of the species in the Paris Museum,

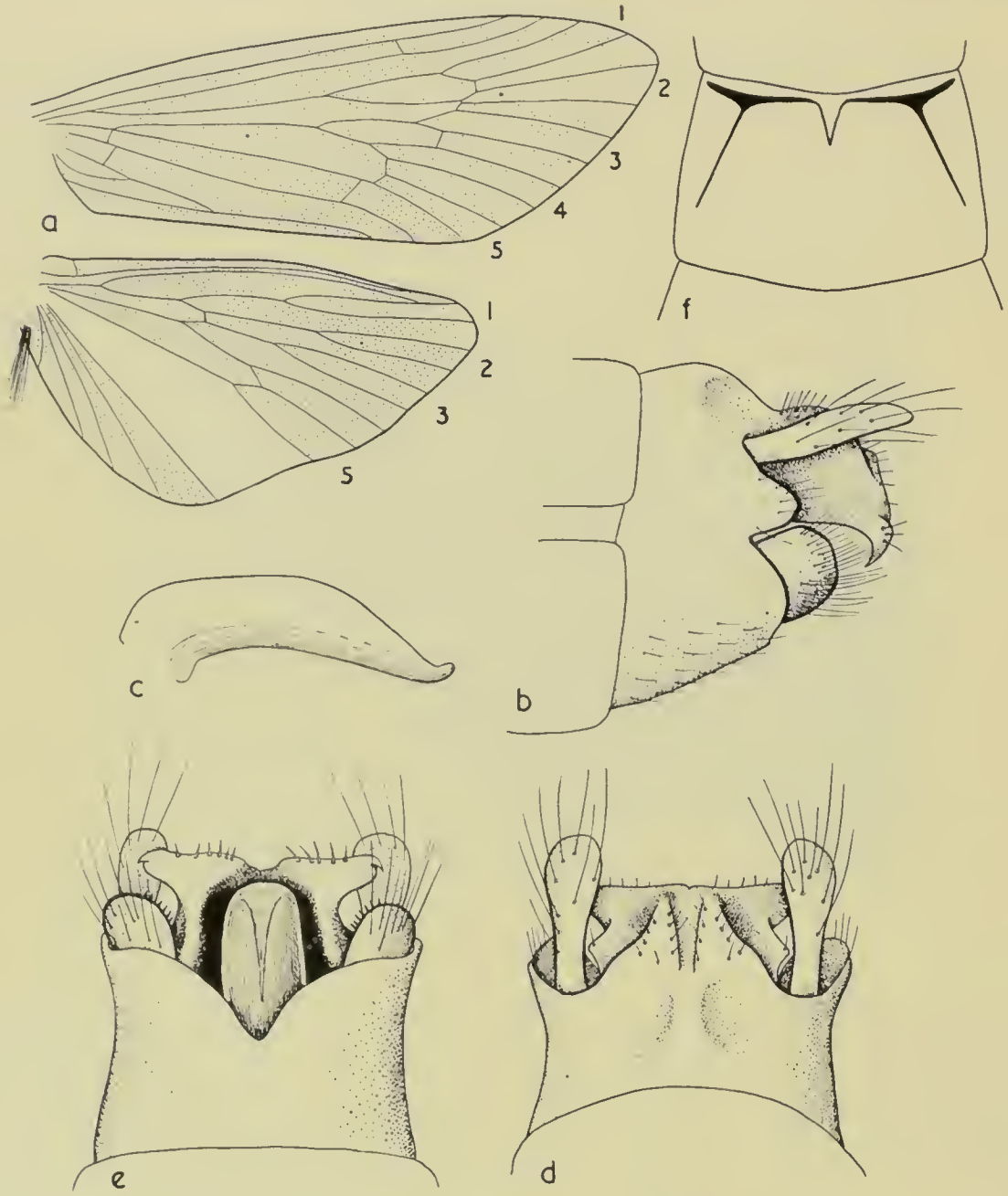

FIG. 116.—*Anisocentropus latifascia* (Walker). ♂. *a*, wings; *b*, genitalia, lateral; *c*, penis, lateral; *d*, genitalia, dorsal; *e*, ventral; *f*, pattern on fourth tergite.

also collected in Australia. Since Australia is established as a habitat of the species, the North American record is very likely an error. Ulmer (1929) recorded the species as not from North America."

[The remains of McLachlan's type of *Anisocentropus flavicaput* have been studied and have been mounted as microscope preparations. Examination of the male genitalia leaves no doubt in my mind that this species is also synonymous with *A. latifascia* (Walker), or at most only a colour variety. Martynov's *Ganonema bicolorata* is also almost certainly a synonym. This species (*latifascia*) varies considerably in general appearance both in the actual colour of the pubescence and in the degree of denudation of the wings ; in good specimens the division of the anterior wings into two colour zones is most marked.

There are examples in the British Museum (N.H.) from AUSTRALIA : N. Australia (*type* of *flavicaput* McLachlan) ; New South Wales, Upper Murrumbidgee River, Bolaro, 22.xii.1935, and Adaminaby, 11.xii.1936, R. J. Tillyard. S.E. Queensland, Tambourine Mts., 11–18.iv.1935, R. E. Turner ; and in the C.S.I.R. Collection, Canberra, from F. C. T., Blundells, 7.i.1930, A. Tonnoir. Queensland, Springbrook, 3000 ft., 30.xi.1932.—D. E. K.]

Anisocentropus bang-haasi Ulmer (figs. 117, 118).

Anisocentropus bang-haasi Ulmer, 1909, *Notes Leyd. Mus.*, **31** : 139, figs. 14, 15.
Anisocentropus bang-haasi Ulmer, 1929, *Deutsch. ent. Z.*, **1929** : 171, 178.

Head and *thorax* light brown. *Antennae* yellowish (incomplete in example before me) not toothed, annulated with brownish in basal third, remainder of antenna paler. *Maxillary palpi* long, pale brown, with blackish hairy vestiture; labial palpi very short, yellowish brown. *Legs* yellowish. *Anterior wing* much widened apically, apical margin feebly rounded ; five triangular patches of white hairs in the apical half ; ground-colour dark brown, with brownish pubescence, which is densest in cubital and anal areas. At the basal anal angle there is a patch of silvery white hairs, and there is a sprinkling of similar hairs amongst the dark brown pubescence in the area between the radius and cubitus. Along the anal margin are three, somewhat elevated, hairless areas, the basal one extending right across the base of the wing. Around the middle raised areas the pubescence is darker brown, with streaks of golden hairs. Of the white apical patches three are anterior and two posterior. The distal anterior patch is the longest ; it runs roughly parallel to the apical margin and reaches the seventh apical vein. The median spot reaches to the fourth apical vein, the proximal spot to the discoidal cell. The proximal posterior spot is the larger. Between the proximal and median anterior spots and between the posterior spots are narrow areas containing blue-violet hairs. Posterior wing brownish, with brown pubescence.

Genitalia, ♂.—Ninth tergite with its upper surface produced in two widely separated acute horns. Dorsal plate broad and deep, its outer apical angles appearing as rounded processes from above, and from the side directed downward in short acute hooks. The centre of its apical margin is produced in two rounded processes, with an excision between them. Superior appendages short, with dilated apices. Side-pieces of the ninth segment triangular, about as long as the superior appendages. Penis short and cylindrical. Inferior

appendages short and triangular from the side, short and wide from beneath, inner upper surfaces set with teeth. Ventral margin of the ninth segment widely excised at its centre.

Length of anterior wing, 10 mm.

The above description is based on an example from AUSTRALIA : North Queensland, vi–vii.1918, R. Veitch, determined by Dr. G. Ulmer. The *type* is from New Pomerania, and other examples have been recorded from Wetter Island, Dutch East Indies, and New Guinea.

FIG. 117.—*Anisocentropus bang-haasi* Ulmer. ♂ anterior wing. (Photo. D. E. K.)

Anisocentropus semiflavus Banks.

Anisocentropus semiflavus Banks, 1939, *Bull. Mus. Comp. Zool. Harv.*, 85 : 483.

Banks describes the species as follows :

" Head and thorax pale clear yellow, abdomen black : legs pale yellow ; palpi pale, last joints with some dark hair ; basal joint of antennae pale yellow, beyond brown, but basal half broadly annulate with pale ; head and thorax with bright yellow hair.

" Fore wings mostly clothed with short yellowish hair, a faint band of darker hair across over the anastomosis, extreme apex also faintly darker ; veins brown ; hind wings gray, clothed with black hair and black fringes, as a whole much darker than fore wings, the costa with yellowish hair.

" In fore wings venation much as others, particularly *A. dilucidus*, the subcosta and radius rather close together, the discal cell slender, its base opposite forking of medius ; the apical forks the same except the cross-vein from radial sector to medius is further out on fork three, and the cross-vein from medius to cubitus is

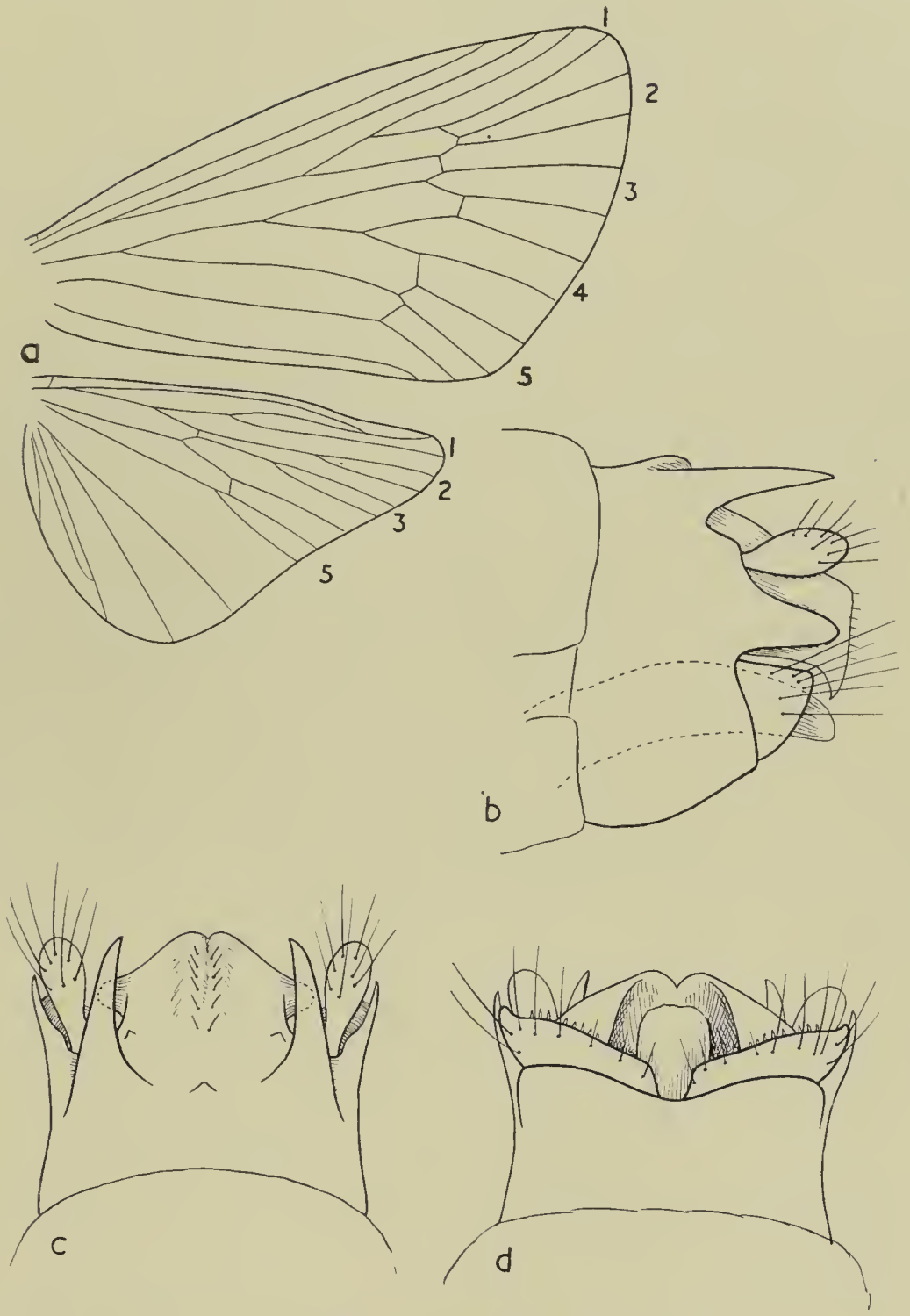

FIG. 118.—*Anisocentropus bang-haasi* Ulmer. ♂. *a*, wings (after Ulmer); *b*, genitalia, lateral; *c*, dorsal; *d*, ventral.

nearly straight across, so that fork five is shorter, and the cross-vein from cubitus to anal is fully its length before base of fork five.

" In hind wings venation much like *A. dilucidus*, but the wing is not so broad toward base.

" Fore wing, 8·5 mm. long.

" From Lake Barrine, Atherton tableland, 2300 ft., April, Queensland, Australia (Darlington)."

Type in the Museum of Comparative Zoology, Harvard College, U.S.A.

10. Fam. **PHILORHEITHRIDAE** Mosely.

Philorheithridae Mosely, 1936, *Proc. Zool. Soc. Lond.*, **1936** : 413.

This family was erected to take *Philorheithrus* Hare and two allied Tasmanian genera. Since its erection two other genera have been discovered on the mainland of Australia. Of these, in addition to *Tasmanthrus*, the new genus *Austrheithrus* also cuts across the main division of the Trichoptera into *Inaequipalpia* and *Aequipalpia* by possessing only three joints to the male maxillary palpi. It also lacks the pilifers which occur in all other genera of the family, but on general venational characters, the presence of a chitinized lobe on the anal margin of the anterior wing, and a nodule on the basal joint of the maxillary palpi, it fits better into the *Philorheithridae* than elsewhere.

The main characters of the family are as follows : *Ocelli* absent. *Spurs* 2, 4, 4. A pair of single-jointed scent-organ (?) processes, or " pilifers," on the frons in the male. A nodule at the apex of the first joint of the *maxillary palpi*, which are generally long, hairy and five-jointed, in both sexes. Generally with forks nos. 1, 2, 3 and 5 in *anterior wing*, 1, 2 and 5 in posterior wing of male, variable in female. A small, rounded, strongly chitinized lobe on the anal margin of the anterior wing towards the base in both sexes. The radius terminates in the first apical sector in the anterior wing.

Key to Genera of *Philorheithridae*.

1. In anterior wing, 3A is free and long, sometimes fused to $Cu_2 + 1A + 2A$ at its apex . . . . . 2.
–. In anterior wing, 3A is absent or fused with A, which in its turn fuses with Cu_2 at its apex . . . . . 4.
2. Radius runs into subcosta in posterior wing, venation alike in both sexes . . . . . *Philorheithrus* Hare (p. 179).
–. Radius runs into first apical sector in posterior wing, venation differing in the two sexes . . . . . 3.
3. Maxillary palpi of male four-jointed ; female with forks nos. 1, 2 and 5 in posterior wing . . . . . *Tasmanthrus* Mosely (p. 183).
–. Maxillary palpi five-jointed ; female with forks nos. 1, 2 3 and 5 in posterior wing . . . . . *Aphilorheithrus* Mosely (p. 186).
4. Male with fold in anterior wing, three-jointed maxillary palpi ; female with forks nos. 1, 2, 3, 4 and 5 in anterior wing . . . *Austrheithrus* gen. n. (p. 190).
–. Male without fold in anterior wing, maxillary palpi five-jointed ; forks nos. 1, 2, 3 and 5 in anterior wing in both sexes . . . *Kosrheithrus* gen. n (p. 195).

Philorheithrus Hare.

Philorheithous Hare, 1910, *Trans. N. Zeal. Inst.*, **42** : 32.
Philorheithrus Tillyard, 1924, *Trans. N. Zeal. Inst.*, **55** : 303.
Philorheithrus Mosely, 1936, *Proc. Zool. Soc. Lond.*, **1936** : 420.

Insects large. *Head* broader than long, very hairy. *Antennae* with the basal joint stout, sometimes specialized in form ; remaining joints clothed with dense hairs. On the *frons* beneath the antennae, in the male sex only, is a pair of very long, single-jointed processes. *Maxillary palpi* five-jointed ; basal joint short, second, third and fourth of about equal length and more than twice as long as the first ; fifth rather shorter than the fourth ; labial palpi, first joint small, second and third each about twice its length. Anterior wing with forks nos. 1, 2, 3 and 5 ; discoidal cell long and narrow ; all apical cells sessile. Posterior wing with forks nos. 1, 2 and 5 present ; fork no. 2 (enclosing the corneous spot) very wide and truncate at the base, the cell below it simulating a fork bearing a short footstalk. Sub-costa flowing into the radius, which continues to the wing margin. Neuration alike in both sexes. *Spurs* 2, 4, 4.

Type species.—*Pseudoeconesus* (?) *agilis* Hudson, 1904.

Philorheithrus agilis (Hudson) (figs. 119, 120).

Pseudoeconesus (?) *agilis* Hudson, 1904, *N. Zealand Neur.* : 64–65, pl. 11, figs. 4–5.
Pseudoeconesus agilis Ulmer, 1907, *Gen. Insect.*, **60a** : 97.
Philorheithous agilis Hare, 1909, *Trans. N. Zeal. Inst.*, **42** : 32.
Philorheithrus agilis Tillyard, 1924, *Trans. N. Zeal. Inst.*, **55** : 305, figs. 17–19.

Hudson describes the species as follows :

" The expansion of the wings is about $1\frac{1}{4}$ inches. The antennae rather stout, and about the same length as the fore-wings. Spurs 2, 4, 4. The fore-wings have the costa slightly arched at the base, and much arched before the apex ; the termen is sharply excavated near the middle. The general colour of the fore-wings is pale brown, paler in the middle with a large almost white patch towards the tornus, partially bordered by a number of dark chocolate brown markings. The hind-wings are yellowish brown, darker towards the apex. The body is dark brown."

To this I add a description of the genitalia.

Genitalia, ♂.—Apical margin of the ninth tergite straight. Superior appendages stout and long ; seen from the side, lower margin strongly dilated, upper margin slightly concave. Between them, at their base, may be seen the upper penis-cover, from the side, long, broad at the base, narrowing to a subacute apex directed downward. From above, the cover is broad and, from beneath, it may be seen that it is formed by two plates welded at their upper edges. From behind, the plates are slightly curved, apices approximating. Penis straight and slender, apex excised. Inferior appendages short, with broad base and slender apex curving slightly upward and inward ; upper margin of the basal part dilated and rounded just before the origin of the produced apical part ; a slender branch arises from within the inner margin near the base, directed upward.

Genitalia, ♀.—The abdomen terminates in a pair of widely separated triangular processes with some indeterminate membranous plates beneath.

Length of the anterior wing, ♂, 12 mm. ; ♀, 14 mm.

New Zealand.

Type probably in Mr. G. V. Hudson's collection.

The perfect insect occurs from December to March.

Hudson describes the early stages as follows :

" The larva constructs a stout, cylindrical and slightly curved case about $\frac{3}{4}$ inch long, composed entirely of large pebbles firmly fastened together with silk. These cases are rather scarce, and are only found in the central and most rapid portions of the river, where the beautiful bright water dashes over the large boulders, resting on a clean and shingly bottom.

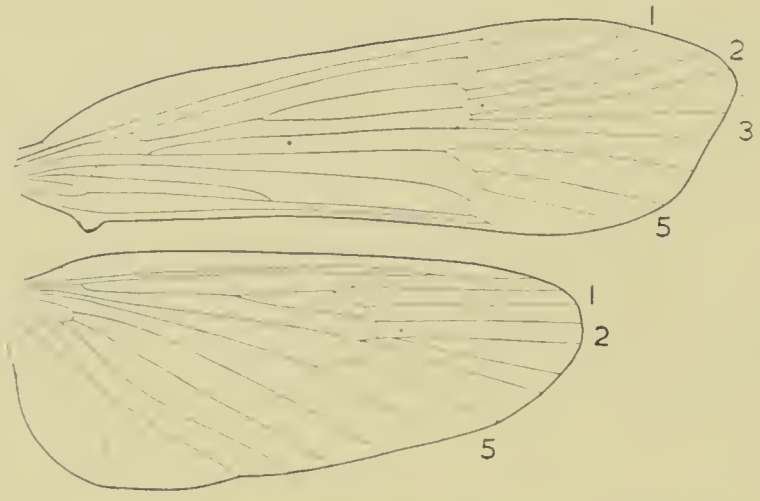

Fig. 119.—*Philorheithrus agilis* (Hudson). ♂ wings.

" The length of the larva when full grown is about $\frac{5}{8}$ inch. The first three segments are pale brown, the third being scarcely horny. The rest of the body is dull white, very large, soft and fat. The sides of all but the last two segments are furnished with a row of extremely short, fine hairs. There is a bunch of very fine respiratory filaments on each segment above and below this line, making four rows in all ; but no filaments are present on the last two segments. The anal segment is abruptly truncated, the upper portion is furnished with numerous spines, and the lower with two small, but very strong, clasping hooks.

" When mature, this larva firmly fastens its case by its posterior end to a boulder, closes each of the apertures with a large pebble, but leaves sufficient space to admit of a free circulation of the water through its dwelling. As usual with these insects, the pupa swims about for some hours before emergence ; and when the caddis-fly finally makes its escape the pupa skin may be found close by, and generally floating on the surface of the water.

" The perfect insect appears early in December. It delights to rest on overhanging twigs, situated close to the most rapid-running water. While thus resting it is extremely difficult to see, the antennae being placed close together and thrust straight in front of the insect, whilst the wings are closely folded around the body. When in

this position the creature much resembles a small stick, but if it be too closely approached it dashes with amazing rapidity into the water, floats down the stream for a considerable distance, and eventually seizes hold of some similar twig at the water's edge, where it reposes as before. These peculiar habits are no doubt protective, and certainly render both the detection and capture of the insect a most

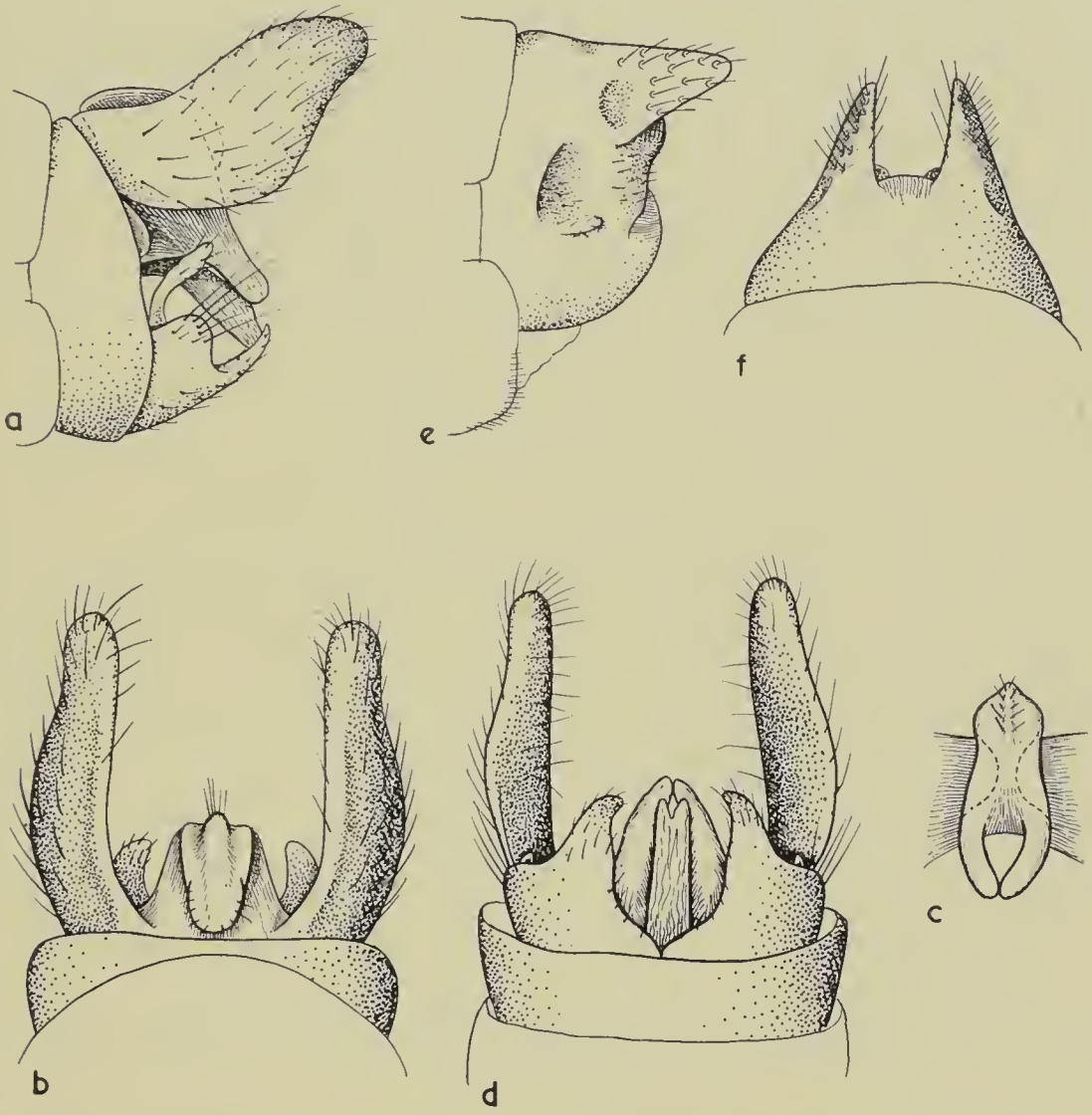

FIG. 120.—*Philorheithrus agilis* (Hudson). *a*, ♂ genitalia, lateral; *b*, dorsal; *c*, upper penis-cover from behind; *d*, ♂ genitalia, ventral; *e*, ♀ genitalia, lateral; *f*, dorsal.

difficult matter. Its movements are, in fact, of such a sudden and bewildering nature that the collector is often taken by surprise and loses his quest. The periodical submersions which this caddis-fly undergoes do not appear in any way to harm it, as the water runs off its hairy wings and back immediately it reappears above the surface."

Philorheithrus lacustris Tillyard (fig. 121).

Philorheithrus lacustris Tillyard, 1924, *Trans. N. Zeal. Inst.*, **55** : 305–306, pl. 19, fig. 10.

Tillyard describes the species as follows :

" ♂. Total length, 8 mm. : forewing, 14 mm. ; expanse, 29 mm. Morphologically very close to *Ph. agilis* (Huds.), from which it may be distinguished by pointed apex and evenly-rounded termen of forewing, much more elongated hindwing with narrowed apex, stronger arching of costa near base, absence of any definite colour-pattern on wing, forewings being a dull medium fuscous, darker towards apices,

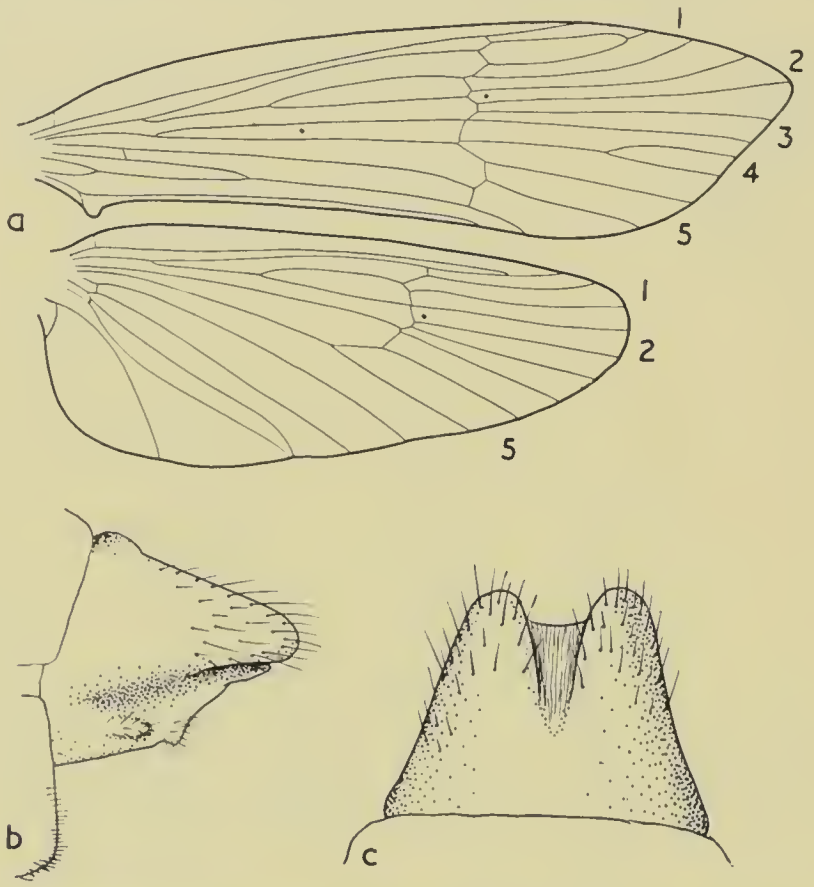

Fig. 121.—*Philorheithrus lacustris* Tillyard (?). ♀. *a*, wings ; *b*, genitalia, lateral ; *c*, dorsal.

with a slightly paler mark on pterostigma, hindwings semi-transparent greyish, tinged yellowish-pink along costal margin. Appendages rather similar those of *Ph. agilis*, pre-anals forming a stout forceps but gonapophyses not projecting at all as in that species, and excessively short.

" ♀. Unknown.

" *Types*.—Holotype and paratype males, Lake Wakatipu, at Kingston (13th December, 1919, R.J.T.) ; both in Cawthron Institute collection.

" *Habitat*.—Shores of Lake Wakatipu ; very rare. The cases and larvae were found attached to rocks near the shore, showing the larval habitat of this species differs greatly from that of its relative *Ph. agilis*. There is a species closely resembling

this, but not yet described, which is very abundant around the shores of the three lakes of the Cradle Mountain massif, in north-west Tasmania."

[To Tillyard's description may be added that the clothing of the posterior wing ♂ consists partly of more broadened hairs than in *Ph. agilis*.—D. E. K.]

There is a male in the British Museum (N.H.) out of the Tillyard Collection from the type locality, taken on the same day as the type and paratype. Unfortunately this specimen lacks the abdomen so that I am unable to give a description and figures of the genitalia. A female (here figured) received from Mr. G. V. Hudson is referred with some doubt to this species. The presence of an additional fork in both anterior wings suggests that this specimen should be placed in the genus *Aphilorheithrus* rather than in *Philorheithrus*, in which the neuration is alike in both sexes, but as the venation in the posterior wing does not fit in with the generic diagnosis of the former genus, it is possible that the single example may be aberrant.

Tasmanthrus Mosely.

Tasmanthrus Mosely, 1936, *Proc. Zool. Soc. Lond.*, **1936** : 414.

Insects rather large. *Antennae* stout, rather shorter than the anterior wing, in the male with a projecting longitudinal shelf on the first joint. In this sex, all joints excepting the first and second bear small, rounded scales amid short, striated hairs. *Maxillary palpi* in the male four-jointed and upturned in front of the face as in the Sericostomatidae, partly membranous ; in the female, five-jointed ; in both sexes a nodule at the apex of the basal joint. In the male only a pair of eversible scent-filaments between the antennae, arising from the head ; these are in addition to the single-jointed processes of the frons, which are rather stouter than in other genera of the family. Neuration of the male conforming with the family characters ; in the female, an additional fork present only in the anterior wing.

Type species.—*Tasmanthrus angustipennis* Mosely, 1936.

Tasmanthrus angustipennis Mosely (figs. 122–124.)

Tasmanthrus angustipennis Mosely, 1936, *Proc. Zool. Soc. Lond.*, **1936** : 414–417, figs. 49–59.

Of this species the only males available are unfortunately in such poor condition that a description of the general appearance would be of little value. The following description of markings etc. is made from the female.

Head fuscous, covered with coarse, cream-coloured hairs ; oculi brown. *Antennae* rather shorter than the anterior wing ; basal joints large, covered with cream-coloured and black hairs, remaining joints fuscous, with cream-coloured annulations, no serrations. *Palpi* fuscous, covered with short cream-coloured and fuscous hairs. *Legs* ochraceous. *Spurs* 2, 4, 4. *Wings* long and narrow, fuscous, anterior with yellowish markings, mainly along the costa, grouped as follows : costal area of the wing towards the apex yellow, shading

off to fuscous and with three distinct fuscous spots extending into the fringes ; three yellow spots on the costa opposite the anastomosis, which is also more or less yellowish ; a few scattered yellow spots along the costa nearly to the base : from the anastomosis to the base of the wing there are plentiful yellow hairs along the radial area. A distinct yellow spot at the base of fork no. 2 and another, rather larger, just beneath it ; another pair of spots occurs towards the base of the wing across the basal angle of the cellula thyridii.

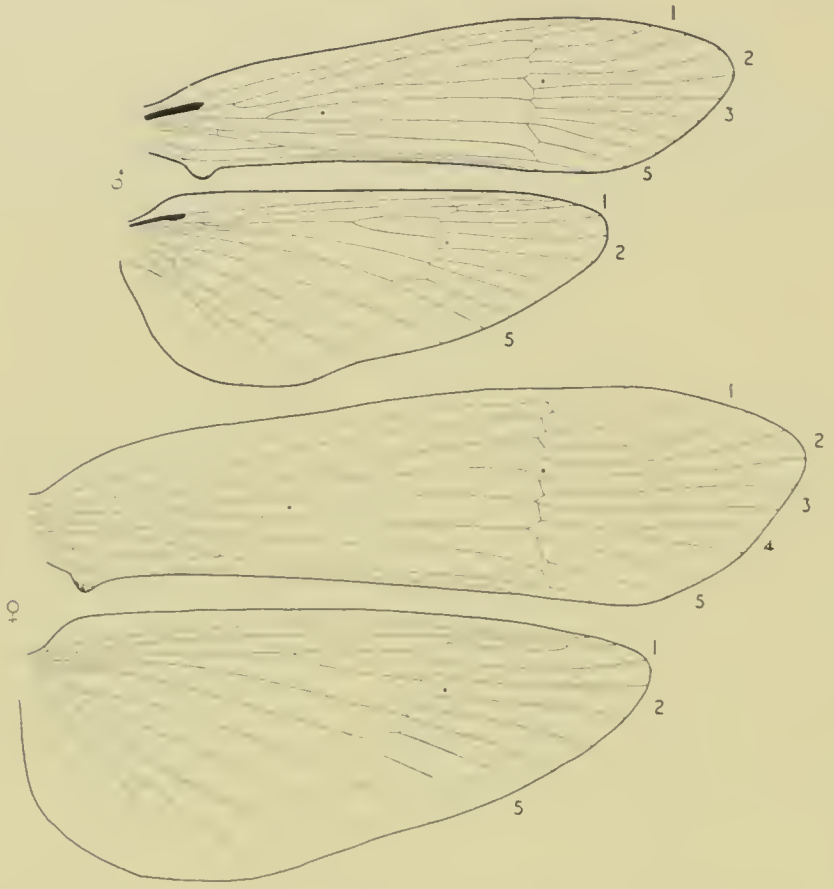

Fig. 122.—*Tasmanthrus angustipennis* Mosely. ♂♀ wings.

I have described the wing-pattern of the single available female in some detail as I have no direct evidence that the male and female are correctly associated with each other. Whilst the shape of the wings and the neuration agree, it would have been more satisfactory if the condition of the male had allowed some comparison of the general appearance of the two sexes.

In the *male* the basal joint of the *antenna* is very large, and there is a projecting, longitudinal shelf on its inner surface : the second joint is very small and rather peg-shaped, with a wide, flattened apex ; the third joint is nearly twice as long as the second and fully twice as long as each of the remaining joints. The basal joint is thickly clad with long, coarse hairs with dilated apices, the second with normal short hairs, and all the remaining joints with

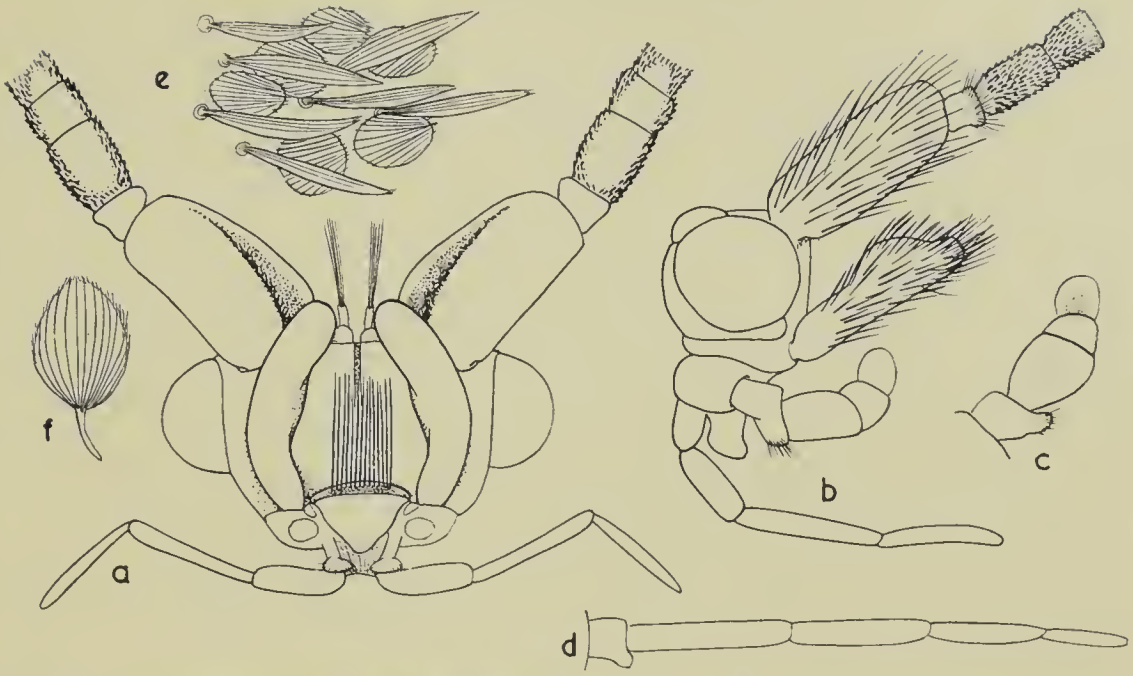

FIG. 123.—*Tasmanthrus angustipennis* Mosely. *a*, ♂ head from in front, showing scent-organs, and with maxillary palpi removed ; *b*, ♂ head from side ; *c*, ♂ maxillary palpi ; *d*, ♀ maxillary palp ; *e*, hairs and scaled from ♂ antenna, much enlarged ; *f*, a scale, more enlarged.

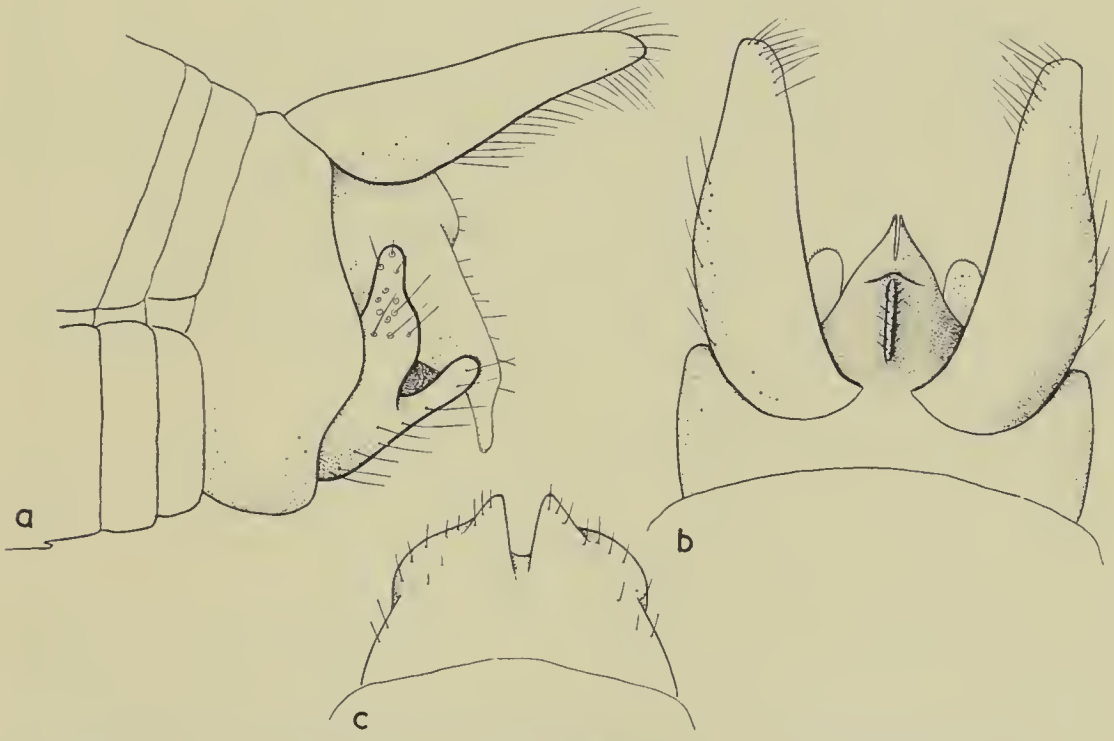

FIG. 124.—*Tasmanthrus angustipennis* Mosely. *a*, ♂ genitalia, lateral ; *b*, dorsal ; *c*, ♀ genitalia, dorsal.

short, striated hairs and small, rounded scales. There is a denuded area on the under surface of part of the third, fourth and fifth joints. Between the basal joints of the antennae and arising from rectangular bases on the head is a pair of small, eversible, membranous filaments, clothed with long hairs. The single-jointed processes of the frons are stout and, from the side, dilated at the middle, clad with long, coarse hairs, almost elongate scales ; they arise on each side of a very narrow, transverse flap. *Maxillary palpi* of the male four-jointed ; basal joint very small and wide, rather more strongly chitinized than the others, and with an apical nodule, the fourth joint mostly membranous; labial palpus with the middle joint slightly longer than the third, which is slightly longer than the first : in the female, the maxillary palpi conform with the customary pattern as regards the short basal joint, with an apical nodule ; second joint longer than the third, which is of about the same length as the fourth and longer than the fifth, which is very short.

Genitalia, ♂.—Superior appendages large, broad at the bases, tapering slightly to rounded apices. From above, outer margins slightly convex, inner straight or slightly concave ; outer margins and inner surfaces at the apices bearing long, fine hairs. The appendages arise from semicircular excisions of the margin of the ninth segment. The margin of this segment is produced at the centre in a pair of arched, downcurved plates welded together along the inner margins to form a raised keel fringed with hairs or bristles ; the apices of these plates are slightly separated but lie closely side by side. The two welded plates form, no doubt, an upper penis-cover and, from above, are broad at the base, tapering to an acute, bifurcate apex. From the side the cover is broad at the base, apex produced in a downwardly directed finger. Penis short, arching downward, only visible in a cleared example. Inferior appendages branched. From the side, lower branch directed tailwards and upward, apex somewhat dilated ; upper branch lying along the margin of the ninth segment, outer margin sinuous or serrated ; a minute process in the centre of the sixth sternite, only visible under a lens.

Genitalia, ♀.—Terminal segment from above produced and excised at the centre of its apical margin to make a pair of triangular processes, the excision between them extending about halfway down the segment ; a small process to the sixth sternite.

Length of the anterior wing, ♂, 10 mm. ; ♀, 14 mm.

TASMANIA : Miena, Great Lake, xii.1930, 1 ♂ (*type*), C. Parker ; xii.1929, 1 ♀, H. M. Stephen ; New Norfolk, xi.1938, 1 ♂, J. W. Evans.

Aphilorheithrus Mosely.

Aphilorheithrus Mosely, 1936, *Proc. Zool. Soc. Lond.*, 1936 : 417–418.

The genus differs from others in the family in having an additional fork in each of the wings in the female sex. Thus in the *anterior wing*, forks nos. 1, 2, 3 and 5 are present in the ♂, nos. 1, 2, 3, 4 and 5 in the ♀ ; in the posterior wing, forks nos. 1, 2 and 5 in the ♂, but 1, 2, 3 and 5 in the ♀. In the *posterior*

wings the sub-costa runs directly to the wing margin ; the radius runs into the first apical sector and is connected with the sub-costa by a cross-vein.

Maxillary palpi five-jointed in both sexes, the basal joint small with a well-developed fringed nodule towards its apex ; second, fourth and fifth joints approximately equal in length, each slightly longer than the third,

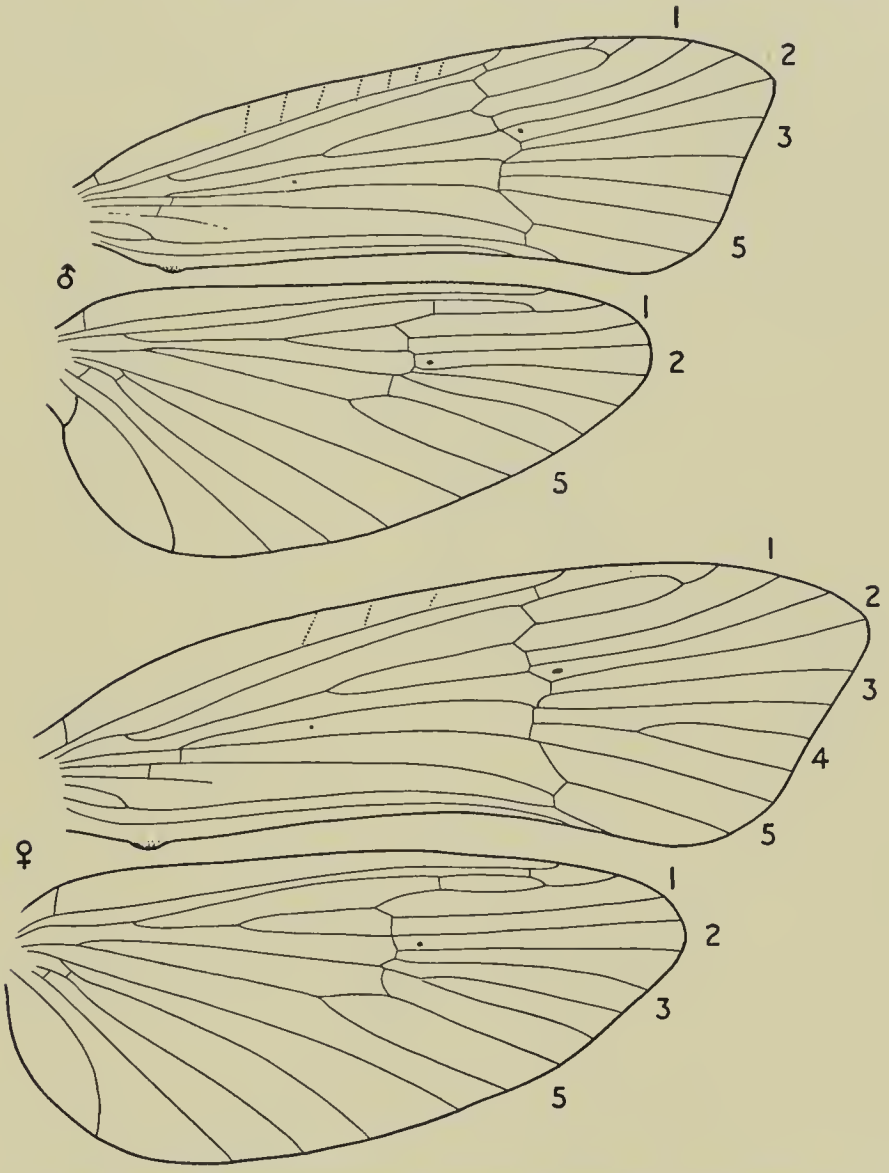

Fig. 125.—*Aphilorheithrus stepheni* Mosely. ♂♀ wings.

which is nearly twice the length of the first ; labial palpi small, all the joints of about the same length.

In the male *genitalia* the superior appendages are fused in a hood.

Type species.—*Aphilorheithrus stepheni* Mosely, 1936.

[In the original description Mr. Mosely gave the forks in the ♀ posterior wing as 1, 2, 4 and 5. Dr. Ulmer has pointed out (*in lit.*) that this is an error in interpretation and that the forks should be 1, 2, 3 and 5.—D. E. K.]

Aphilorheithrus stepheni Mosely (figs. 125–127).

Aphilorheithrus stepheni Mosely, 1936, *Proc. Zool. Soc. Lond.*, **1936** : 418–420, figs. 60–67.

Head fuscous, with rather coarse, greyish hairs mixed with fuscous ; basal joint of the *antenna* large, thickly clothed with mixed greyish and fuscous hairs ; remaining joints chocolate-fuscous strongly annulated with greyish, and with a raised rib around each joint, giving a strongly serrate effect, more particularly on the under surface. Each joint fits into a cup-like depression

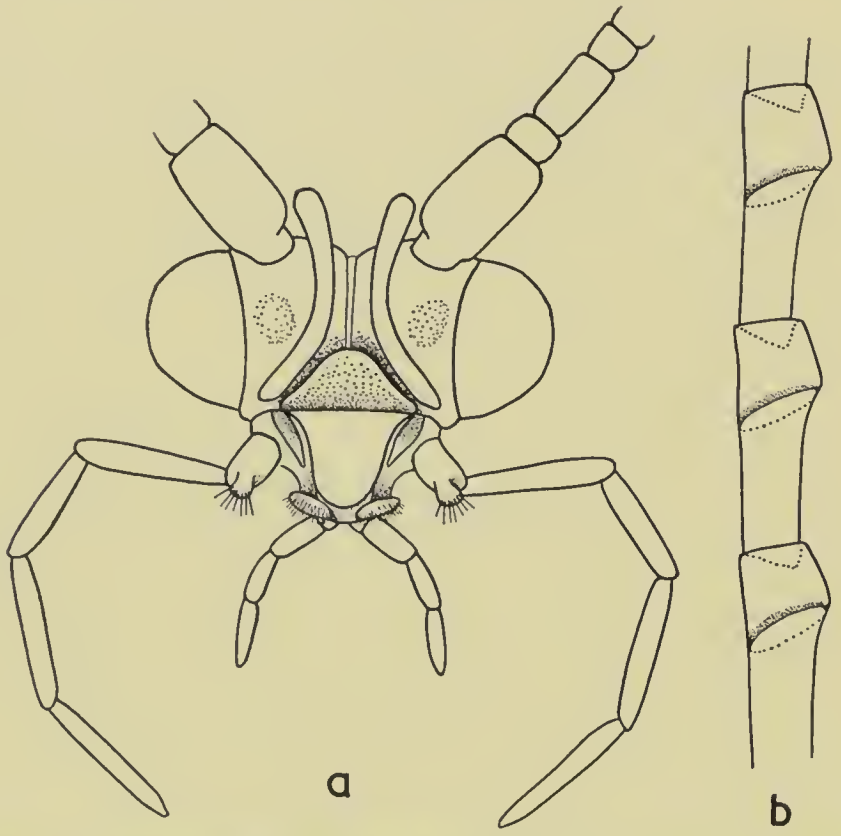

Fig. 126.—*Aphilorheithrus stepheni* Mosely. ♂. *a*, head ; *b*, portion of antenna, more enlarged.

in the apex of the preceding joint. The base of this cup is set obliquely so that there is an angular projection of the rim on the lower side. Oculi black ; both *maxillary* and labial palpi thickly clothed with greyish and fuscous hairs. In the male a pair of single-jointed processes arising one on each side of a triangular flap, partly detached from the frons ; the apices of these processes lie between the basal joints of the antennae. The processes occur in the male sex only ; they no doubt form part of a scent-distributing apparatus. *Legs* stout, clothed with greyish hairs. *Spurs* 2, 4, 4. *Wings* greyish fuscous, anterior, broad at the apex, the margin of which is obliquely truncate and slightly concave ; the concave part bears a narrow white fringe, very notice-

able in the female, in which sex the wings are of a warmer tone; neuration as indicated in the figures.

Genitalia, ♂.—Ninth tergite produced in a large, triangular hood with the apex bifurcate; beneath the apex the forks are produced to form triangular, parallel keels. There is a large, hood-like upper penis-cover, with the apex excised and directed upwards. Penis strongly chitinized and straight.

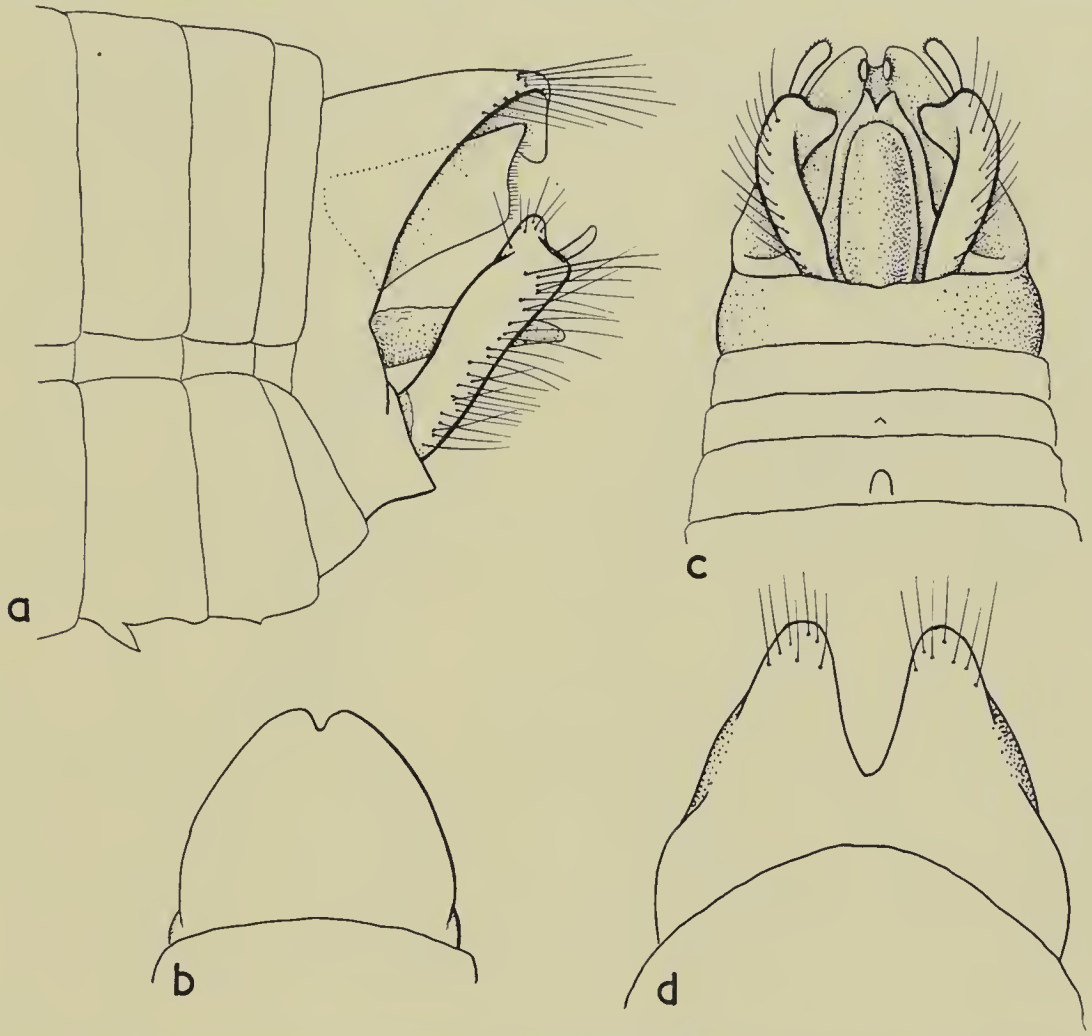

Fig. 127.—*Aphilorheithrus stepheni* Mosely. *a*, ♂ genitalia, lateral; *b*, dorsal; *c*, ventral; *d*, ♀ genitalia, dorsal.

Inferior appendages two-jointed; basal joint very large with a much dilated and truncate apex, of which the upper angle is rounded as seen from the side; second joint very small and set towards the lower apical angle. A minute process to the seventh and a larger to the sixth sternites.

Genitalia, ♀.—Terminal dorsal segment produced in two triangles, the excision between them extending nearly to the base of the segment; a minute process to the sixth sternite.

Length of the anterior wing, ♂, 13 mm.; ♀, 16 mm.

Tasmania : Miena, 3300 ft., xii.1929, i.1930, H. M. Stephen, xii.1930, C. Parker ; Deloraine, 20.xii.84 ; Waratah, McLachlan Coll.

Australia : New South Wales, Kiandra, various dates ; Mt. Kosciusko ; Upper Murrumbidgee River, various localities and dates, Tillyard Coll.

Austrheithrus gen. n.

Spurs 2, 4, 4. In the male the *antenna* with a ridge along the basal joint, which is large, the remaining joints normal in shape. *Maxillary palpi* three-jointed ; basal joint very small, with a rounded nodule at its apex on the inner margin, second and third joints very long and slender, hairy ; pilifers wanting. *Anterior wing* much broadened at its apex ; sub-costa and radius widely separated from the other veins ; radius rather weak, and either terminates in the first apical sector, or in a cross-vein between the sub-costa and the first apical sector. A longitudinal fold passing along nearly the full length of the wing, and slightly obscuring the upper margin of the discoidal cell. Forks nos. 1, 2, 3, 4 and 5 probably present in anterior wing, their origins a little obscured by the fold, nos. 1, 2 and 5 in posterior wing. In anterior wing apparently only one anal vein present, which fuses with Cu_2 near its apex. Anal lobe very strongly developed and triangular. In the female the venation is more regular, although the corneous point in the anterior wing is cut off from fork no. 2 in a small cell. Forks nos. 1, 2, 3, 4 and 5 present in anterior, 1, 2 and 5 in posterior wing. An acute process to the sixth sternite in both sexes.

Type species.—*Austrheithrus dubitans* sp. n.

[The position of this genus is doubtful. In the absence of the pilifers it forms an exception in the *Philorheithridae*, and the wing neuration also varies considerably from that in the other genera of this family. It follows more closely that of some *Sericostomatidae* in this respect. It possesses two *Philorheithridae* characters, the strongly chitinized lobe on the anal margin of the anterior wing at the base, and the nodule at the apex of the first joint of the maxillary palpus, in which there are three joints only. In its general appearance it might easily be mistaken for *Kosrheithrus tillyardi* sp. n. (p. 195).

Objection might be raised to the selection as fork no. 2 in the male anterior wing a cell above the one containing the corneous point. To adopt any other course, however, would leave us with an additional vein beyond the normal complement between the costa and R_5. In the female anterior wing the complete enclosure of the corneous point shows that on occasions this point can be outside fork no. 2, as is the case also in the *Leptoceridae*.—D. E. K.]

Austrheithrus dubitans sp. n. (fig. 128).

Insect greyish. *Head* dark ochraceous with pale, cream-coloured hairs. *Antennae* with the basal joint clothed with a dense mass of golden and cream-coloured hairs which conceal a projecting ridge ; remaining joints bearing a mass of minute hairlets scarcely visible except under a high-power lens.

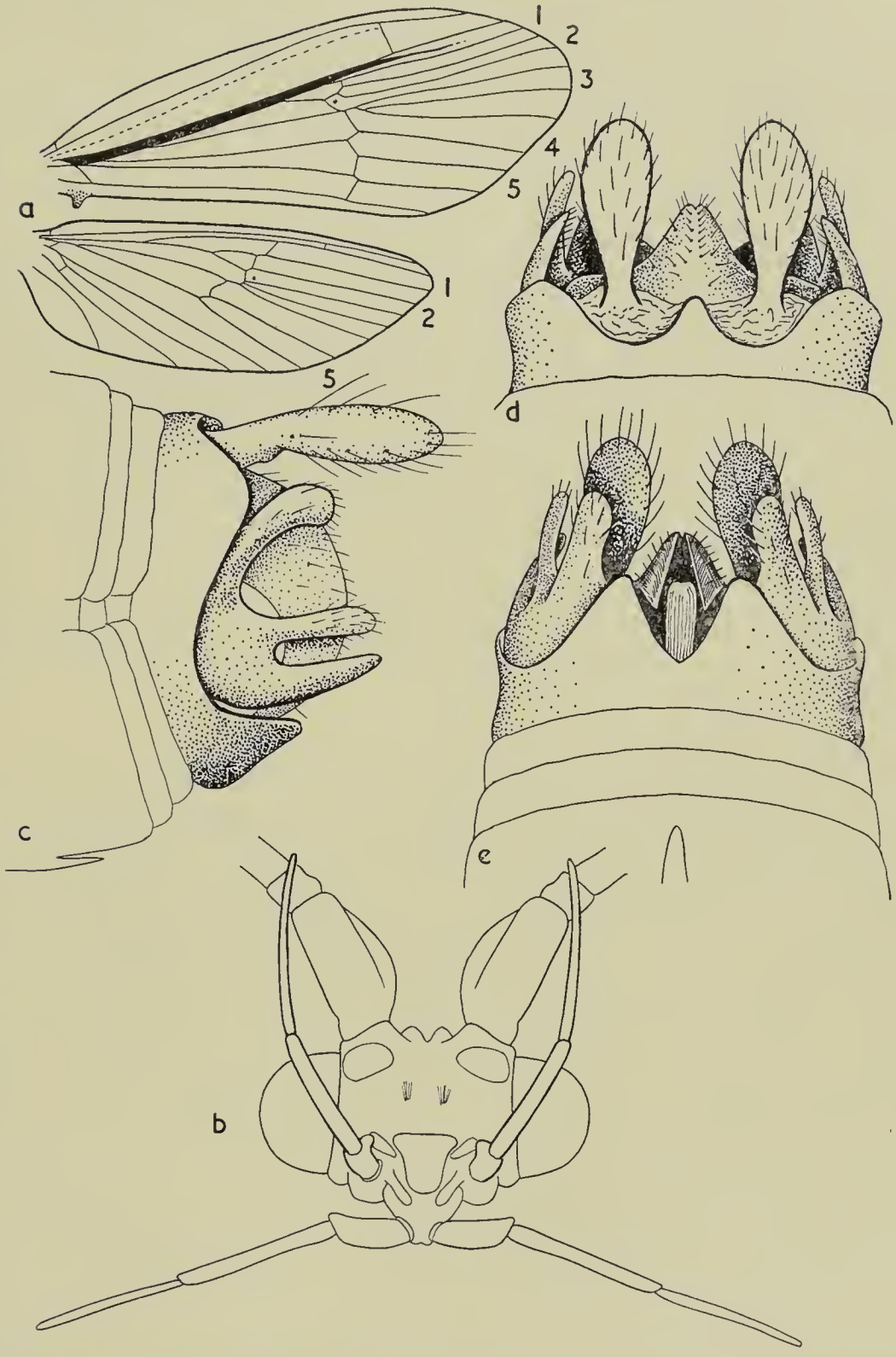

FIG. 128.—*Austrheithrus dubitans* gen. sp. n. ♂. *a*, wings; *b*, head from in front; *c*, genitalia, lateral; *d*, dorsal; *e*, ventral.

Anterior wing greyish, much dilated at the apex, with a longitudinal fold extending across the wing partly obscuring the upper margin of the discoidal cell. Interrupted patches of dark hair along the costa and a dark patch towards the distal end of the posterior margin. Anal nodule very long, triangular. *Posterior wing* of the same colour as the lighter portions of the anterior. Legs ochraceous, clothed with short greyish hair.

Genitalia, ♂.—From above, apical margin of the ninth segment produced at its centre, with rounded excisions on each side of the produced part. In these excisions are set the superior appendages, which are moderately long and somewhat clavate. Between the appendages is seen the upper penis-cover, formed by two plates set on edge and fused above, leaving an excision between, seen from beneath ; from the side, the plates appear as a broad claw directed downward and enclosing a short, arched penis. Inferior appendages three-branched, all the branches situated laterally and of about the same length, the upper branch with a clavate apex, set rather apart from the other two and separated from them by a rounded excision. The margin of the ninth ventral segment produced in a pair of triangles side by side with a deep excision between them.

Length of the anterior wing, ♂, 11 mm.

Female unknown.

Australia : New South Wales, Club Lake, Mt. Kosciusko, 6000 ft., 1.ii.1930, 1 ♂, R. J. Tillyard ; Spencer's Creek, Mt. Kosciusko, 6000 ft., 29.i.1930, 1 ♂ (*type*), R. J. Tillyard.

Austrheithrus ronewa sp. n. (figs. 129, 130).

Insect greyish, but the example described is teneral and the posterior wings are aberrant in neuration. At the time of description no other specimen was available, so that the description and figures of the ♂ genitalia given here were drawn up from this specimen. Later a second example was found and this was selected as the type. Figures are given of anterior wing of the paratype and the posterior wing of the type. There is no difference between the two specimens in the neuration of the anterior wings.

♂. In the *anterior wing* the fold in *ronewa* is definitely more concave than in *dubitans*. Basal joint of the *antenna* large, apex dilated and truncate, upper angle slightly overlapping the base of the second joint, which is small ; third joint more than twice the length of the second, longer than each of the remaining joints. *Maxillary palpi* : basal joint short, with a small nodule on the inner surface, second joint long, third rather shorter than the second.

Genitalia, ♂.—From above, apical margin of the ninth segment slightly produced at its centre. Superior appendages moderately long and parallel, set somewhat towards the centre of the margin, not clavate at the apices as in *dubitans* ; between them may be seen the upper penis-cover, similar in form to that of *dubitans*. Penis also as in *dubitans*, short and arched. Inferior appendages three-branched, but the branches stouter and the proportions of the branches differing from those of *dubitans*, the two lower branches being

stouter than the upper, centre branch the longest. The margin of the ninth ventral segment produced at its centre in a pair of triangular processes as in *dubitans*.

♀. *Maxillary palpi* with the basal joint short with a nodule at the base; second joint very long, third and fourth shorter than the second and about equal, fifth shorter than either the third or fourth.

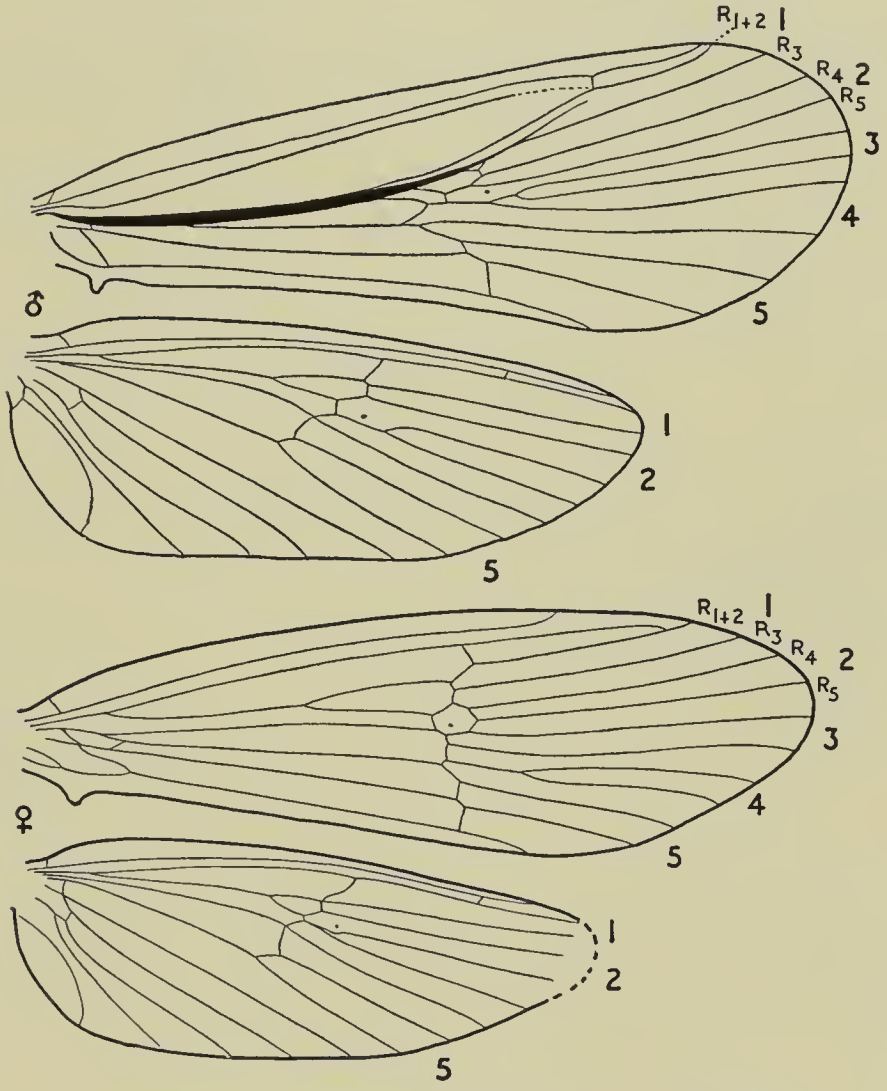

Fig. 129.—*Austrheithrus ronewa* sp. n. ♂♀ wings.

Genitalia, ♀.—From above, the abdomen terminates in a pair of wide, triangular processes. From beneath, the eighth sternite is pigmented to give the false appearance of a wide, distal excision.

Length of the anterior wing, ♂, 10 mm. ; ♀, 12 mm.

Tasmania : New Norfolk, iii.1935, 1 ♂, xi.1938, 1 ♀, J. W. Evans.

Australia : New South Wales, Mt. Kosciusko, 2700 ft., 22.i.1885, 1 ♂, McLachlan Collection (*type*).

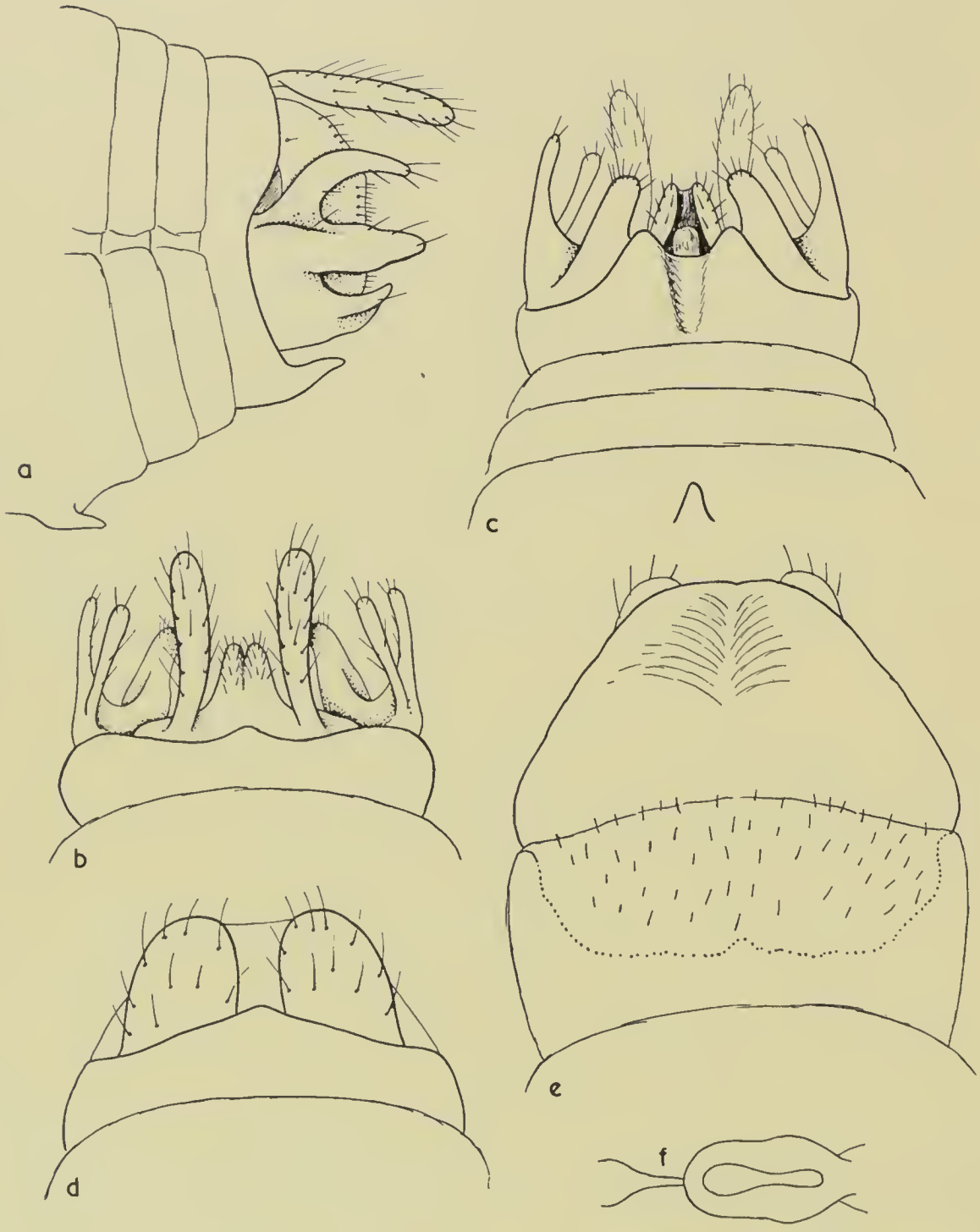

FIG. 130.—*Austrheithrus roncwa* sp. n. *a*, ♂ genitalia, lateral; *b*, dorsal; *c*, ventral; *d*, ♀ genitalia, dorsal; *e*, ventral.

Kosrheithrus gen. n.

This genus has been erected to take a New South Wales insect, from Mt. Kosciusko. It differs from all other genera in the family (except *Austrheithrus*) in the apparent presence of only one anal vein, fused near its apex with Cu_2, in the anterior wing. The males can be readily separated from *Austrheithrus* by the absence of the long fold in the anterior wing, and the females by the absence of fork no. 4 in the anterior wing. Radius terminates in the first apical sector in both wings and in both sexes. Forks nos. 1, 2, 3 and 5 in anterior wing, nos. 1, 2 and 5 in posterior wing in both sexes. *Spurs* 2, 4, 4.

Type species.—*Kosrheithrus tillyardi* sp. n.

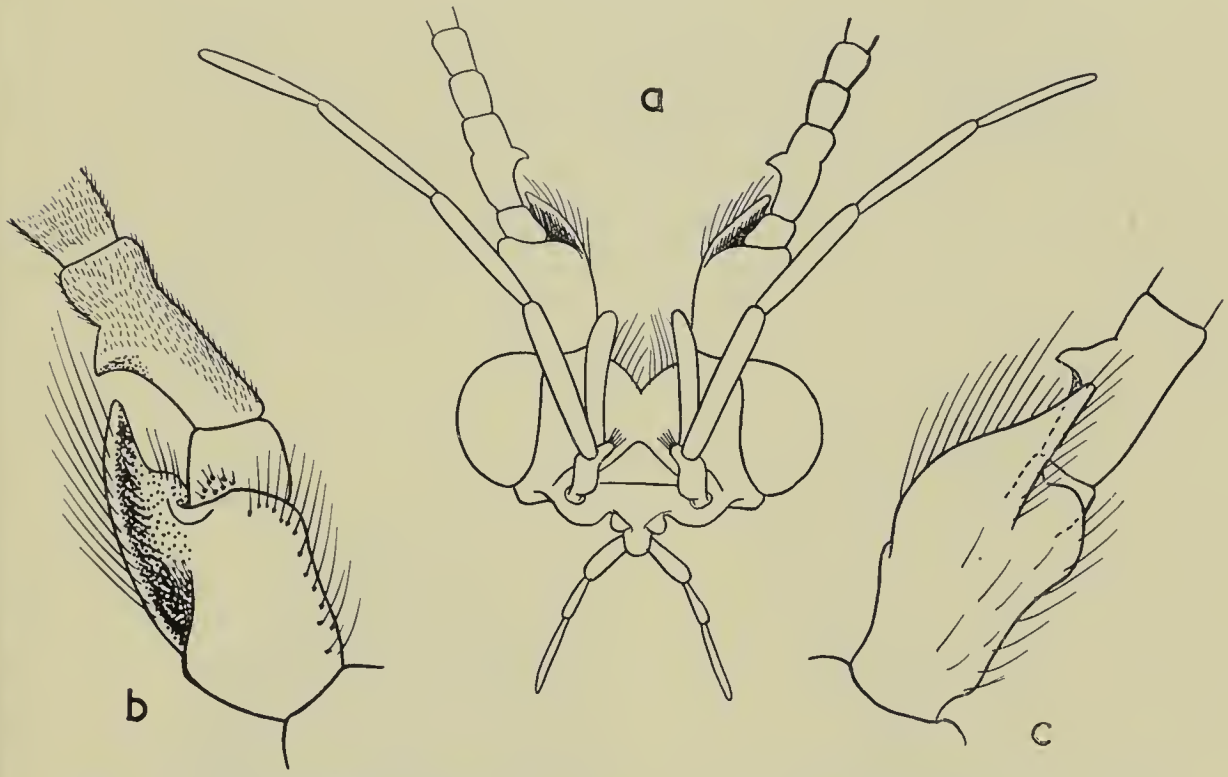

Fig. 131.—*Kosrheithrus tillyardi* gen. sp. n. ♂. *a*, head from front; *b*, left antenna, inner surface; *c*, right antenna, dorsal surface.

Kosrheithrus tillyardi sp. n. (figs. 131–133).

Insect generally creamy grey. *Antenna* of the male with a large basal joint bearing on its upper surface a leaf-like plate with a produced and pointed apex; second joint small, third as long or longer than the first, with a tooth on its inner margin towards the centre; remaining joints each rather longer than the second. *Maxillary palpi* with the usual specialized basal joint, the four other joints approximately equal; pilifers slightly shorter than second joint of maxillary palp. *Anterior wings* creamy greyish with an interrupted dark streak passing longitudinally across the centre of the wing. Apex rounded in the male, produced and pointed in the female.

Genitalia, ♂.—Apical margin of the ninth tergite with a rounded excision at its centre, on each side of which arises a large, rounded plate ; these approach each other towards the centre of their inner margins. In the cleft thus formed

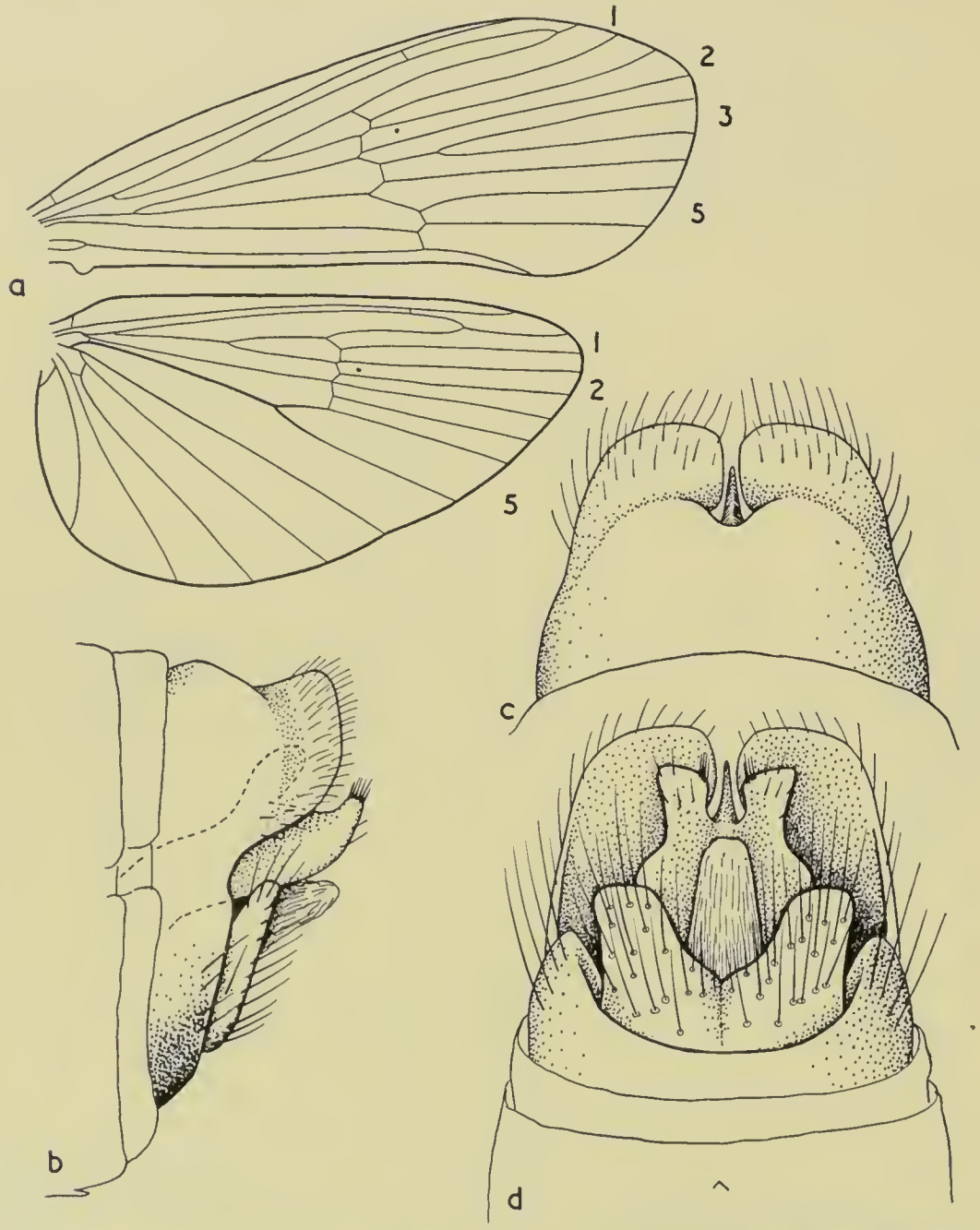

Fig. 132.—*Kosrheithrus tillyardi* sp. n. ♂. *a*, wings ; *b*, genitalia, lateral ; *c*, dorsal ; *d*, ventral.

may be seen the centre portion of the upper penis-cover, which consists of a pair of wide processes with truncate apical margins and a central, superimposed branch, narrow and with an acute apex from above and below,

rounded from the side. The lower and wider processes each bears on its inner apical angle a fine bunch of hairs which, in dried examples, are matted together and appear as spines. Penis short and straight. Inferior appendages short and very broad, welded at their bases from below ; apices truncate. A minute process to the seventh sternite.

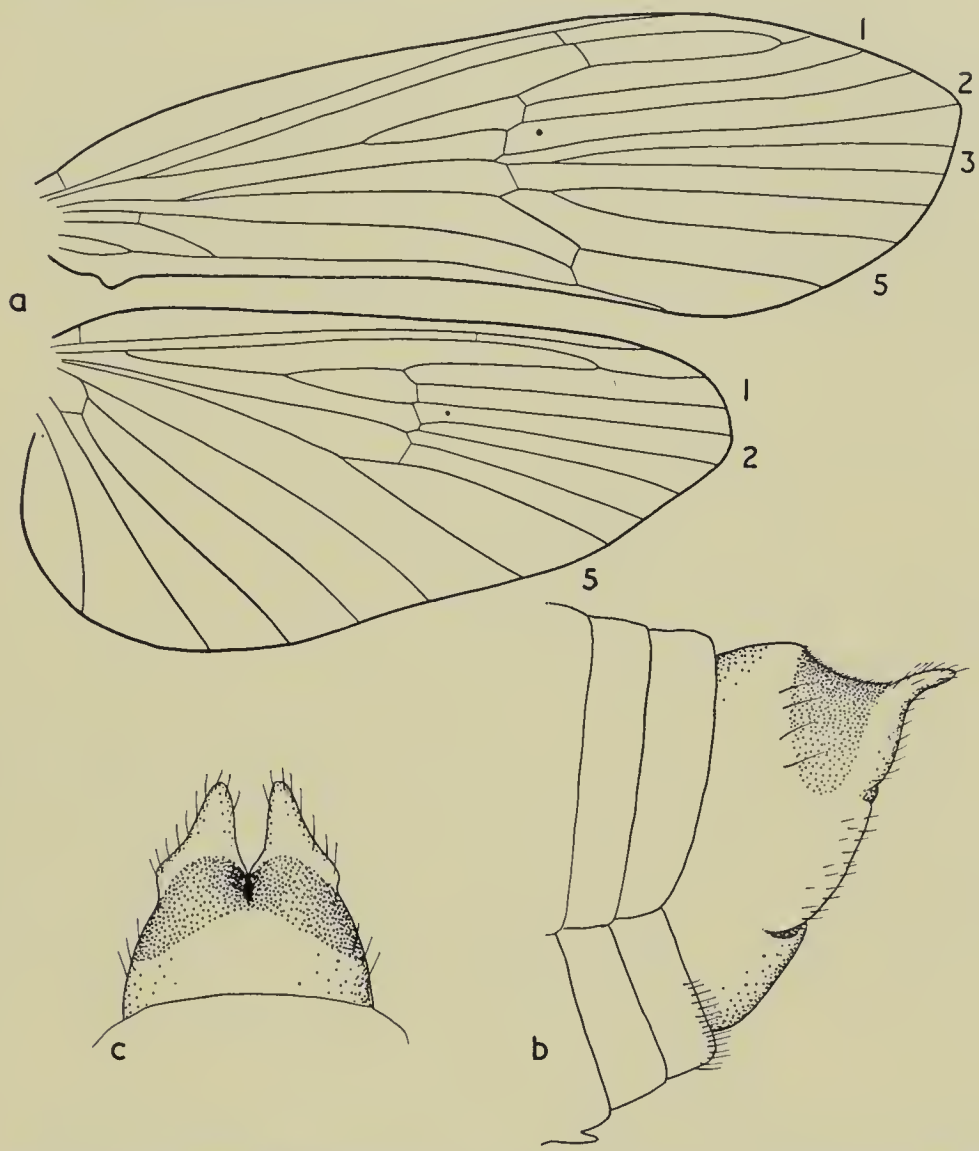

Fig. 133.—*Kosrheithrus tillyardi* sp. n. ♀. *a*, wings ; *b*, genitalia, lateral ; *c*, dorsal.

In the female the abdomen terminates in a bifurcate hood, each branch with an acute apex, from above, tapering to an acute apex from the side.

Length of the anterior wing, ♂, 15 mm. ; of the ♀, 19–21 mm.

Australia : New South Wales, Mt. Kosciusko, 5000 ft., no date, 1 ♂ (*type*), 1.ii.1930, 9 ♂, 2 ♀, 24.xi.1921, 1 ♂, 1 ♀, i.1929, 4 ♂, 1♀, R. J. Tillyard ; Mt. Kosciusko, 4800 ft., 21.i.1885, 2 ♂, from the McLachlan Collection ; Hampton, i.18, 1 ♂, R. J. Tillyard ; Murrumbidgee River, 4.x.1930, 1 ♂.

11. Fam. **LEPTOCERIDAE** Leach.

Leach, 1815, in Brewster's *Edinburgh Encycl.*, 9 : 136.
McLachlan, 1877, *Rev. Syn. Trich.* : 293.
Ulmer, 1907, *Gen. Insect.*, 60a : 129.

Spurs 0, 2, 2 or 1, 2, 2 or 2, 2, 2 or 2, 2, 4 ; inner spur longer than outer. *Antennae* very thin and long. *Maxillary palpi* thin, five-jointed, densely hairy ; all joints long, fifth (and sometimes part of fourth) joint flexible, but not articulated. *Ocelli* absent. *Anterior wing* long, generally narrow, with simple venation ; no median cell ; discoidal cell always closed. Apical forks nos. 1 and 5 generally present ; fork no. 3 sometimes present in female. In *posterior wing* the discoidal cell is either closed (*Triplectidinae*) or open (*Leptocerinae*). Apical fork no. 2 always absent, forks nos. 1 and 5 generally present. In neither anterior nor posterior wing does the radius terminate in the first apical sector, nor is it joined to it by a cross-vein.

Key to Subfamilies.

1. Discoidal cell in posterior wing closed . . . *Triplectidinae* Ulmer (p. 198).
–. Discoidal cell in posterior wing open . . . *Leptocerinae* Ulmer (p. 272).

Subfam. **TRIPLECTIDINAE** Ulmer.

Triplectidinae Ulmer, 1906, *Notes Leyd. Mus.*, 28 : 105.
Triplectidinae Ulmer, 1907, *Coll. Selys*, 6 (1) : 41–42.
Triplectidinae Ulmer, 1907, *Gen. Insect.*, 60a : 129.
Triplectidinae Mosely, 1936, *Trans. R. ent. Soc. Lond.*, 85 : 92.

Antennae very long and slender. *Maxillary palpi* five-jointed, long and hairy, terminal joint flexible but not articulated. *Ocelli* absent. *Anterior* wing densely pubescent ; neuration sometimes irregular in the male. *Posterior wing* broad, with the posterior margin often slightly excised at the third anal vein ; basal part of the wing generally dilated, at least in the male. Median cell in anterior wing absent ; discoidal cell in both wings present ; in the anterior wing forks nos. 1 and 5 present in the male, nos. 1, 3 and 5 in the female ; in the posterior wing the forks are nos. 1, 3 and 5 or 3 and 5 only in both sexes. *Spurs* 0, 2, 2 or 2, 2, 2 or 2, 2, 3 or 2, 2, 4 or 2, 4, 4.

Key to Genera of *Triplectidinae*.

1. Anterior wing, discoidal cell with its lower apical angle more or less produced downwards towards the thyridial cell, the cross-vein closing it generally concave . . . . . *Triplectides* Kolenati (p. 199).
–. Anterior wing, discoidal cell not produced downward at its apex, cross-vein closing it straight . . . . . 2.
2. Fork no. 1 present in posterior wing (sometimes small) . . . . . 3.
–. Fork no. 1 absent in posterior wing (aberrantly present in some *Notalina delicatula*) . . . . . 6.
3. Anterior wing, fork no. 1 and apical cell no. 4 with very short footstalks, almost reaching the anastomosis . . . . . *Triplexa* gen. n. (p. 228).
–. Anterior wing, these cells not with unusually short footstalks . . . . 4.
4. Discoidal cell of posterior wing decidedly longer than its footstalk *Triplexina* gen. n. (p. 231).

–. Discoidal cell of posterior wing shorter (or at most only slightly longer) than its footstalk . . . . . 5.
5. Anterior wing of male with the lower margin of discoidal cell and the adjacent vein below it thickened ; thyridial cell absent ; in female with media forking at anastomosis . . . . . *Triplectidina* Mosely (p. 233).
–. Anterior wing of male without such thickened veins ; thyridial cell present ; in female with media forking well beyond anastomosis *Hudsonema* Mosely (p. 237).
6. Anterior wing of male with media and lower margin of discoidal cell merged to make a longitudinal fold ; female with media forking at anastomosis (female of *Lectrides* not known) . . . . . 7.
–. Anterior wing of male without a longitudinal fold ; female with media forking beyond anastomosis . . . . . *Notalina* Mosely (p. 248).
7. Anterior wing of male, fork no. 5 reaches to base of discoidal cell ; posterior wing, fork of media reaches at least to cross-vein below discoidal cell ; spurs 2, 2, 2 . . . . . *Symphitoneuria* Ulmer (p. 260).
–. Anterior wing of male, fork no. 5 reaches to about middle of discoidal cell ; posterior wing, fork of media does not reach cross-vein below discoidal cell ; spurs 2, 2, 4 . . . . . *Lectrides* gen. n. (p. 270).

Triplectides Kolenati.

Triplectides Kolenati, 1859, *Gen. et spec. Trich.*, 2 : 247–248.
Pseudonema McLachlan, 1862, *Trans. ent. Soc. Lond.*, (3) 1 : 305.
Tetracentron Brauer, 1865, *Verh. zool.-bot. Ges., Wien*, 15 : 418.
Tetracentron Brauer, 1866, *Novara Reise, Neur.* : 11–12.
Notanatolica McLachlan, 1866, *Trans. ent. Soc. Lond.*, (3) 5 : 256–257.
Pseudonema McLachlan, 1868, *Journ. Linn. Lond. Zool.*, 10 : 212.
Pseudonema McLachlan, 1871, l.c., 11 : 128.
Pseudonema Hutton, 1899, *Trans. N. Zeal. Inst.*, 31 : 240.
Notanatolica Hutton, 1899, l.c. : 241.
Pseudonema Hudson, 1904, *N. Zeal. Neur.* : 72.
Notanatolica Hudson, 1904, l.c. : 76.
Triplectides Ulmer, 1905, *Ann. Nat. Hist. Hofmus. Wien*, 20 : 71.
Tetracentron Ulmer, 1905, l.c. : 71.
Pseudonema Ulmer, 1905, l.c. : 71.
Notanatolica Ulmer, 1905, l.c. : 72.
Triplectides Ulmer, 1905, *Stett. ent. Zeit.*, 66 : 29.
Notanatolica Ulmer, 1906, *Notes Leyd. Mus.*, 28 : 31–35.
Notanatolica Ulmer, 1907, *Gen. Insect.*, 60a : 130.
Triplectides Ulmer, 1907, l.c. : 131.
Triplectides Tillyard, 1924, *Trans. N. Zeal. Inst.*, 55 : 306.
Triplectides Mosely, 1936, *Trans. R. ent. Soc. Lond.*, 85 : 92.
Notanatolica Mosely, 1936, l.c. : 93.

In the *anterior wing* the discoidal cell is generally, but not invariably, long, its lower distal angle produced downwards towards the posterior margin, the cross-vein closing it generally concave. This downward production of the angle of the discoidal cell may be taken as the most important character by which *Triplectides* is separated from the other genera in the sub-family. In this wing, forks nos. 1 and 5 are present in the ♂, nos. 1, 3 and 5 in the ♀. Posterior wing dilated in the anal area, with usually a strong excision of the posterior margin near the base in the ♂ ; forks nos. 1, 3 and 5 generally present in both sexes, no. 1 with a footstalk (fork no. 1 absent in *T. albana* and *T. volda*). *Spurs* 2, 2, 2 or 2, 2, 4 or 2, 4, 4.

In the ♂ *genitalia* there is always a pair of superior appendages of varying length, a large upper penis-cover with generally an excised apex ; there are conspicuous inferior appendages, three-branched ; the second branch is usually claw-shaped. At the base of each appendage in most of the species is a pair of inner plates which extend across towards each other and may serve as a lower penis-cover. In a kindred genus, *Triplexina*, these plates are absolutely united to each other to form a single structure beneath the penis.

Type species.—*Mystacides gracilis* Burmeister, 1839.

Key to Species of *Triplectides*, Males.

(Not listed owing to lack of information concerning spurs : *T. australica* Banks, *T. australis* Navás, *T. elongata* Banks, *T. parva* Banks.)

1. Spurs 2, 2, 2 . . . . . 2.
–. Spurs 2, 2, 4 or 2, 4, 4 . . . . . 7.
2. Fork no. 1 in posterior wing present . . . . . 3.
–. Fork no. 1 in posterior wing absent . . . . . *T. volda* sp. n. (p. 210).
3. Inferior appendage with terminal branch nearly twice as long as basal part ; eyes unusually large . . . . . *T. similis* sp. n. (p. 210).
–. Inferior appendage with terminal branch at most only slightly longer than basal part, eyes normal . . . . . 4.
4. Basal branch of inferior appendage rather stout . . . . . 5.
–. Basal branch of inferior appendage slender . . . . . 6.
5. Margin of ninth tergite strongly produced . . *T. cephalotes* (Walker) (p. 204).
–. Margin of ninth tergite excised or truncate . . *T. magna* (Walker) (p. 200).
6. Anterior wing, discoidal cell longer than its footstalk *T. gilolensis* (McLachlan) (p. 206).
–. Anterior wing, discoidal cell shorter than its footstalk *T. ciuska* sp. n. (p. 209).
7. Spurs 2, 2, 4 ; fork no. 1 in posterior wing present . . . . . 8.
–. Spurs 2, 4, 4 ; fork no. 1 in posterior wing absent . *T. albana* sp. n. (p. 223).
8. Posterior wing very broad at base, its width more than half the length of wing *T. niveipennis* sp. n. (p. 217).
–. Posterior wing not unduly wide at base . . . . . 9.
9. Superior appendages long and slender . . *T. obsoleta* (McLachlan) (p. 212).
–. Superior appendages short . . . . . 10.
10. Apices of inner plates of inferior appendages triangular. Upper penis-cover cleft at apex. In posterior wing, media forks at cross-vein below discoidal cell . . . . . *T. dubius* sp. n. (p. 219).
—. Apices of inner plates of inferior appendages hooked or truncate. Upper penis-cover with a minute notch at apex, but not cleft. In posterior wing, media forks beyond cross-vein below discoidal cell . . . . . 11.
11. Clothing of head and thorax brown . . . . *T. tambina* sp. n. (p. 217).
—. Clothing of head and thorax white, mingled with some brown hairs *T. varius* sp. n. (p. 221).

Triplectides magna (Walker) (figs. 134–136).

Leptocerus magnus Walker, 1852, *Cat. Neur. Brit. Mus.*, **1** : 73.
Leptocerus cognatus McLachlan, 1862, *Trans. ent. Soc. Lond.*, (3) **1** : 306.
Leptocerus canescens McLachlan, 1862, *Trans. ent. Soc. Lond.*, (3) **1** : 306–307.
Leptocerus magnus McLachlan, 1862, *Trans. ent. Soc. Lond.*, (3) **1** : 307.
Leptocerus canescens Hagen, 1864, *Verh. Zool. Bot. Ges. Wien*, **14** : 828.
Leptocerus cognatus Hagen, 1864, *Verh. Zool. Bot. Ges. Wien*, **14** : 828.
Leptocerus magnus Hagen, 1864, *Verh. Zool. Bot. Ges. Wien*, **14** : 829.
Notanatolica magna McLachlan, 1866, *Trans. ent. Soc. Lond.*, (3) **5** : 257, pl. 19, figs. 3*a–e*.

Notanatolica cognata McLachlan, 1866, *Trans. ent. Soc. Lond.*, (3) **5** : 257.
Notanatolica cognata McLachlan, 1868, *Journ. Linn. Soc. Lond. Zool.*, **10** : 212, pl. 2, fig. 6.
Notanatolica magna McLachlan, 1868, *Journ. Linn. Soc. Lond. Zool.*, **10** : 212.
Notanatolica cognata McLachlan, 1873, *Ann. Mag. N. H.*, (4) **12** : 40.
Notanatolica cognata Hutton, 1899, *Trans. N. Zeal. Inst.*, **31** : 241.
Notanatolica cognata Hudson, 1904, *N. Zealand Neur.* : 77.
Notanatolica cognata Ulmer, 1905, *Ann. k.k. Naturh. Hofmus. Wien*, **20** : 71.
Notanatolica magna Ulmer, 1906, *Notes Leyd. Mus.*, **28** : 32–35.

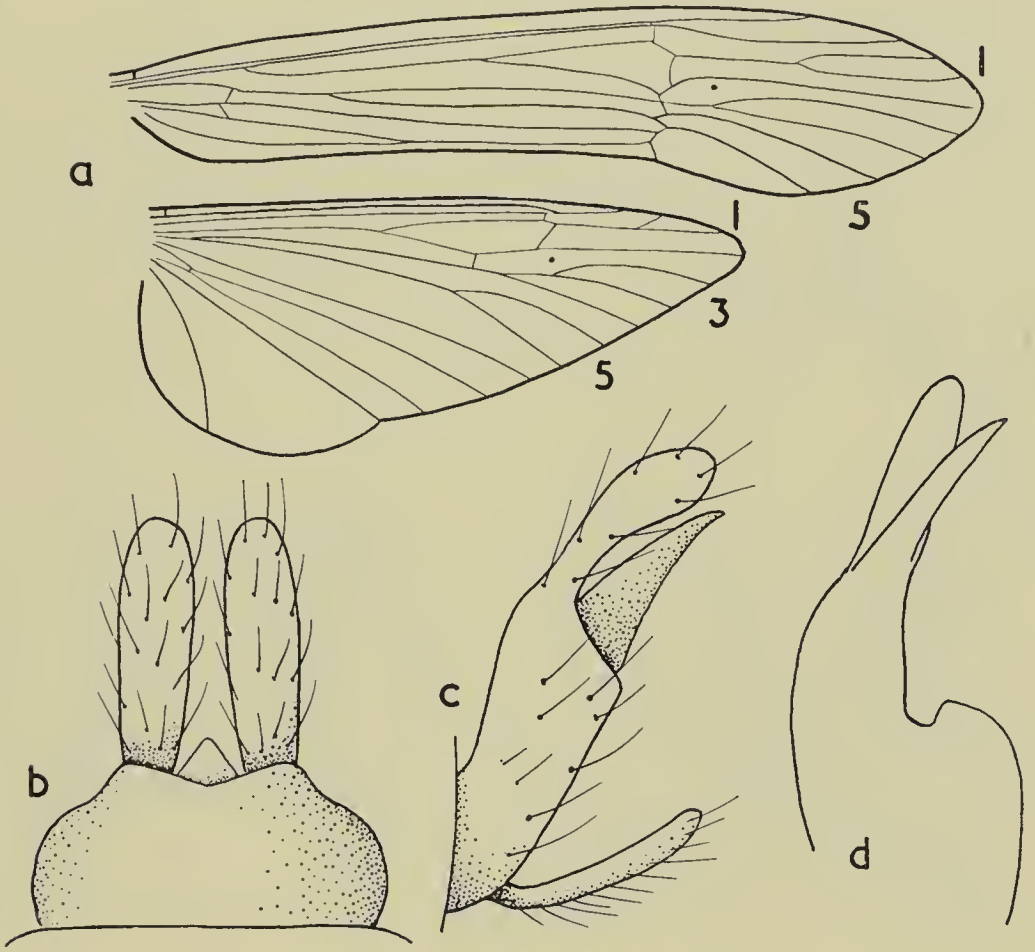

Fig. 134.—*Triplectides magna* (Walker). ♂ type. *a*, wings ; *b*, ninth segment and superior appendages, dorsal ; *c*, inferior appendage, lateral ; *d*, inferior appendage, ventral.

Notanatolica magna Ulmer, 1907, *Coll. Zool. Selys*, **6** (1) : 41.
Notanatolica magna Ulmer, 1907, *Gen. Insect.*, **60a** : 130.
Notanatolica magna Ulmer, 1908, *Deutsch. Ent. Zeitschr.*, **1908** : 344.
Notanatolica magna Ulmer, 1908, in Michaelsen and Hartmeyer, *Fauna S.W. Austr.*, (3) **2** : 30.
Notanatolica magna Betten, 1909, *Rec. Ind. Mus.*, **3** : 239.
Notanatolica magna Ulmer, 1911, *Deutsch. Ent. Zeitschr.*, **1911** : 400.
Notanatolica magna Ulmer, 1913, *Ent. Mitt.*, **2** : 49.
Notanatolica magna Banks, 1913, *Proc. ent. Soc. Wash.*, **15** : 176.

Notanatolica magna Ulmer, 1916, *Ark. Zool.*, (13) **10** : 18.
Notanatolica magna Banks, 1916, *Philip. Journ. Sci.*, **11** : 213.
Notanatolica legendrina Navás, 1923, *Rev. Ac. Cienc. Zaragoza*, **7** : 50.
Notanatolica magna Tillyard, 1925, *Rec. S. Aust. Mus.*, **3** : 44.
Notanatolica legendrina Ulmer, 1926, *Arch. Naturges.*, **91a** (5) : 64.
Notanatolica magna Ulmer, 1926, *Arch. Naturges.*, **91a** (5) : 64.
Notanatolica magna Tillyard, 1926, *Ins. Austr. N. Zeal.* : 393, fig. Y11.

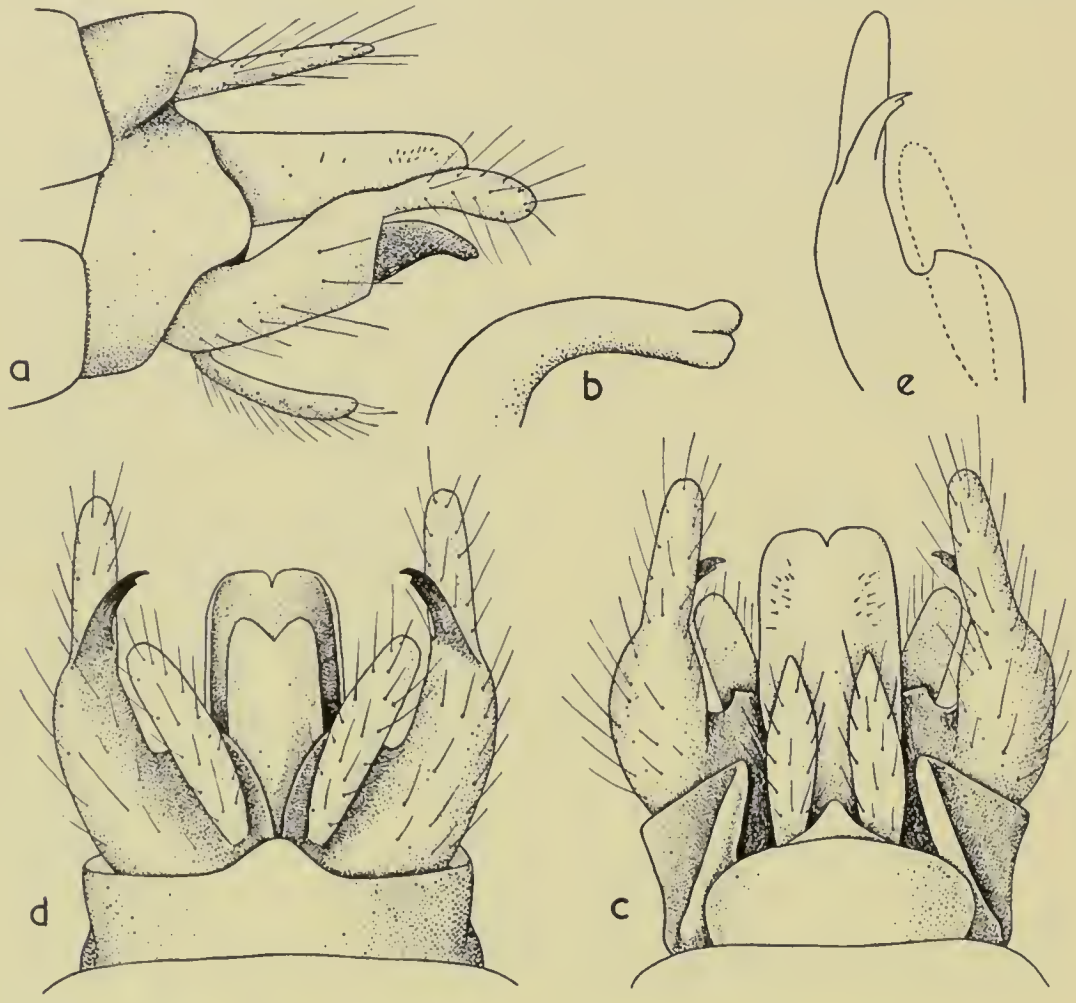

Fig. 135.—*Triplectides magna* (Walker). ♂ paratype. *a*, genitalia, lateral ; *b*, penis, lateral ; *c*, genitalia, dorsal ; *d*, ventral ; *e*, inferior appendage, ventral.

Notanatolica magna Ulmer, 1930, *Treubia*, **11** : 404, 462.
Notanatolica magna Martynov, 1930, *Proc. Zool. Soc. Lond.*, **1930** : 110.
Notanatolica legendrina Martynov, 1930, *Proc. Zool. Soc. Lond.*, **1930** : 110.
Notanatolica legendrina Ulmer, 1932–3, *Pekin Nat. Hist. Bull.*, **7** : 148.
Notanatolica magna Ulmer, 1932–3, *Pekin Nat. Hist. Bull.*, **7** : 55, 149.
Triplectides magna Mosely, 1936, *Trans. R. ent. Soc. Lond.*, **85** : 100–103, figs. 2, 23–35.
Notanatolica magna Martynov, 1936, *Rec. Ind. Mus.*, **38** : 250–251, figs. 12*a–c*.
Triplectides magna Betten and Mosely, 1940, *F. Walker Types Trich., Brit. Mus.* : 229–233, figs. 115–117.
Notanatolica legendrina Banks, 1940, *Proc. U.S. Nat. Mus.*, **88** : 220.

Walker describes the species as follows :

" Ferruginous, clothed with hoary hairs : palpi black, rather hairy : antennae black, more than five times the length of the body, ferruginous at the base ; tips of the joints white : abdomen at the base beneath and legs testaceous : fore-wings fawn-colour, with darker veins : hind-wings slightly gray. Length of the body 4–5 lines ; of the wings 15–19 lines."

" *a–d.* Van Dieman's Land. From Dr. Hooker's collection."

" *e.* Van Dieman's Land. Presented by R. Butler, Esq."

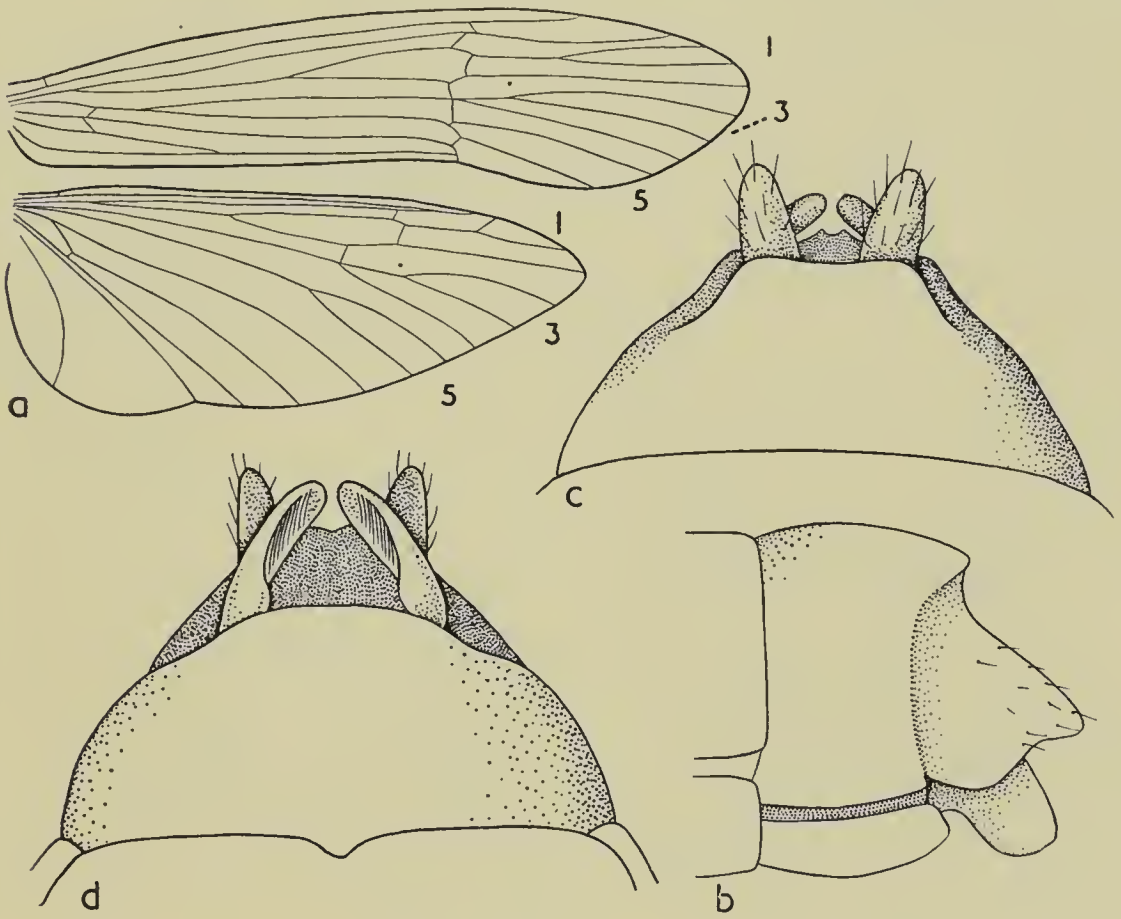

Fig. 136.—*Triplectides magna* (Walker). ♀. *a*, wings ; *b*, genitalia, lateral ; *c*, dorsal ; *d*, ventral.

To this may be added that the *spur* formula is 2, 2, 2, and the genitalia are described as follows :

Genitalia, ♂.—Margin of the terminal dorsal segment widely excised, with a small, membranous, triangular plate in the centre of the excision ; superior appendages fringed with stout hairs, from above, long with rounded apices. Upper penis-cover large and rectangular, apical margin truncate, with a narrow excision at its centre ; lateral margins downwardly bent, partly enclosing the penis, which has a deeply excised apex. Inferior appendages

three-branched ; main branch with a wide, obtuse excision midway along its under surface ; at the angle so formed is jointed the second branch, which is short and terminates in an acute apex, directed slightly inwards from above and beneath ; this apex is sometimes bifurcate. The main branch tends to become membranous at its apex, where it carries a few, widely scattered hairs. From beneath, the appendages are very stout, and at their bases arise the long, finger-like third branches ; lower surfaces fringed with long hairs. At the base of each appendage, seen from beneath, and inside the third branches, are broad, somewhat hook-shaped plates. The margin of the terminal ventral segment is produced at its centre in a small triangular process.

Genitalia, ♀.—Terminal dorsal segment somewhat produced at the centre ; from above, margin truncate. There are two short, rather broad superior appendages, and beneath these a pair of ear-shaped processes, set on edge from above and below, and striated on the inner surfaces ; there is a membranous plate between them with an excised apex. Margin of the eighth sternite excised at its centre.

The genitalia of the males are somewhat variable, and some of the figures given here are drawn from a paratype in which it may be noticed that the superior appendages are more acute at their apices, the margin of the terminal dorsal segment rounded instead of excised, and the second branches of the inferior appendages bifurcate at their apices and perhaps shorter than those of the type.

The species is very widely distributed, the recorded range extending from India to China, Japan, Australia, Tasmania, New Zealand, etc.

The perfect insect has been recorded from August to April.

Triplectides cephalotes (Walker) (fig. 137).

Leptocerus cephalotes Walker, 1852, *Cat. Neur. Brit. Mus.*, **1** : 73.
Leptocerus cephalotes Hagen, 1864, *Verh. Zool. Bot. Ges. Wien*, **14** : 828.
Notanatolica cephalotes McLachlan, 1866, *Trans. ent. Soc. Lond.*, (3) **5** : 257.
Notanatolica cephalotes McLachlan, 1868, *Journ. Linn. Soc. Lond. Zool.*, **1** : 212.
Notanatolica cephalotes McLachlan, 1873, *Ann. Mag. N. H.*, (4) **12** : 41.
Notanatolica cephalotus Hutton, 1900, *Trans. N. Zeal. Inst.*, **31** : 242.
Notanatolica cephalotus Hudson, 1904, *N. Zealand Neur.* : 77.
Notanatolica cephalotes Ulmer, 1906, *Notes Leyd. Mus.*, **28** : 34.
Notanatolica cephalotes Ulmer, 1907, *Gen. Insect.*, **60a** : 130.
Triplectides cephalotes Mosely, 1936, *Trans. R. ent. Soc. Lond.*, **85** : 91, 104, figs. 38–42.
Triplectides cephalotes Betten and Mosely, 1940, *F. Walker Types Trich. Brit. Mus.* : 228–229, fig. 114.

Walker describes the species as follows :

" Ferruginous, testaceous beneath : head broader than the thorax : palpi slightly hairy : antennae testaceous, more than four times the length of the body, with a black ring on each joint : thorax with three brownish stripes : legs testaceous : wings subhyaline ; veins testaceous. Length of the body 3¼ lines ; of the wings 14 lines."

" *a*. New Zealand. Presented by Dr. Sinclair."

" The wings of the specimen described are much rubbed."

To this may be added that the *spurs* are 2, 2, 2, and the male *genitalia* very closely resemble those of *T. magna* ; the margin of the terminal dorsal segment is more produced and the superior appendages appear broader and shorter.

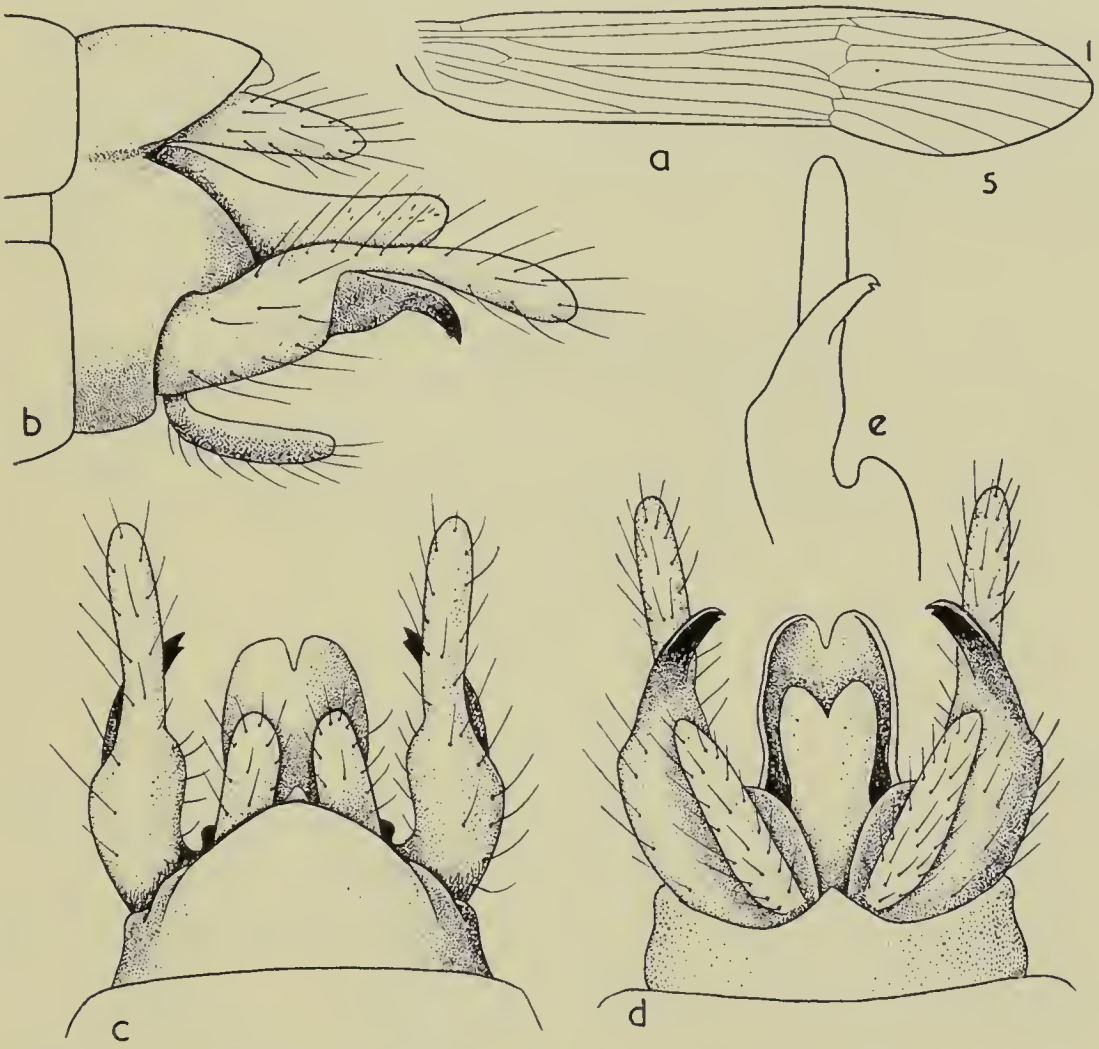

Fig. 137.—*Triplectides cephalotes* (Walker). ♂. *a*, anterior wing ; *b*, genitalia, lateral ; *c*, dorsal ; *d*, ventral ; *e*, inferior appendage, ventral.

[Mosely (1936) has suggested that this species may be a form of *T. magna*. The two are certainly closely allied, but I think that he is correct in considering them to be distinct. Originally described from New Zealand material, Mosely has determined as *T. cephalotes* specimens from Banks Isl. and from Norfolk Isl. There is in the British Museum (N.H.) a long series from W. Australia (Yanchep, near Perth, 13–23.xi.1935, R. E. Turner) and one or two examples from Brisbane which I consider to be *T. cephalotes*. This species is perhaps a little greyer in general appearance than *T. magna*, the anterior wing is slightly

more pointed and the cell below fork no. 5 in this wing is rather narrower.—D. E. K.]

Triplectides gilolensis (McLachlan) (figs. 138, 139).

Notanatolica gilolensis McLachlan, 1866, *Trans. ent. Soc. Lond.*, (3) **5** : 258.
Notanatolica gilolensis Ulmer, 1906, *Notes Leyd. Mus.*, **28** : 31–34.
Notanatolica gilolensis Ulmer, 1907, *Gen. Inseet.*, **60a** : 130.
Notanatolica gilolensis Ulmer, 1915, *Deutsch. Ent. Zeitsehr.*, **1915** : 55–56.
Notanatolica gilolensis Banks, 1930, *Journ. F. M. States Mus.*, **16** : 395, 421.
Notanatoliea opposita Betten, *nec* Walker, 1909, *Rec. Ind. Mus.*, **3** : 240, pl. 17, figs. 5–8.
Notanatoliea luzonensis Navás, 1923, *Mem. Pont. Accad. n. Linc.*, (2) **6** : 16–17.
Notanatolica luzonensis Ulmer, 1930, *Treubia*, **11** : 403.
Triplectides gilolensis Mosely, 1936, *Trans. R. ent. Soe. Lond.*, **85** : 104–107, figs. 43–47.

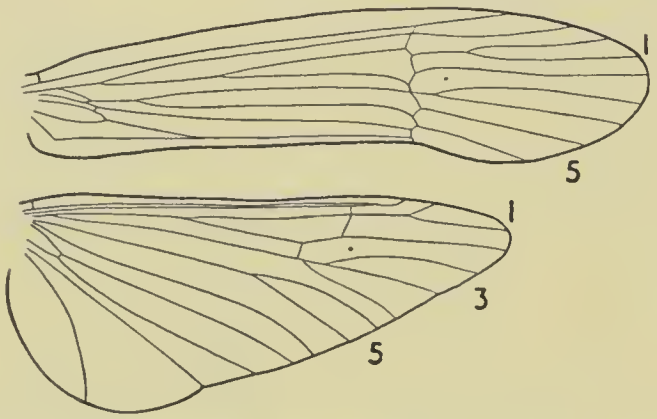

Fig. 138.—*Triplectides gilolensis* (McLachlan). ♂ wings.

McLachlan, in his description of this species, has unfortunately selected a female from Gilolo Island for the *type*, but he mentions that there is, in the Saunders Collection, in the British Museum (N.H.),

"a male from New Guinea, which I think belongs to this species but is smaller than the female described above (exp. alar. 14 lin.), whereas in *N. magna* the female is considerably smaller than the male."

Having regard to the different habitat of these two specimens, it is perhaps inadvisable to attach too much importance to this discrepancy in size, and as the neuration, apart from the usual sexual differences, agrees very closely in the two specimens, I describe the New Guinea insect as the male of *gilolensis*. The wings of this species are generally smaller and narrower than those of *magna*. *Spurs* 2, 2, 2.

The description of the colour of so old a specimen has little or no value, so I give here McLachlan's original description :

"Antennae pale whitish-grey, with very indistinct paler annulations towards the base ; the basal joint fuscous. Head and thorax fuscous. Palpi dark fuscous, clothed with grey hairs. Anterior wings greyish-brown, with grey and brown pubescence intermixed ; a whitish spot at the thyridium. Posterior wings smoky-

grey, subhyaline ; the neuration dark fuscous. Legs pale greyish-brown. Abdomen dark fuscous, with broad greyish-ochreous lateral lines. In the female the superior valves are somewhat elongated and obtuse."

" Long. antenn. 22 lin. ; corp. $4\frac{1}{2}$ lin. ; exp. alar. 16 lin."

" Habitat in insula Gilolo (Wallace)."

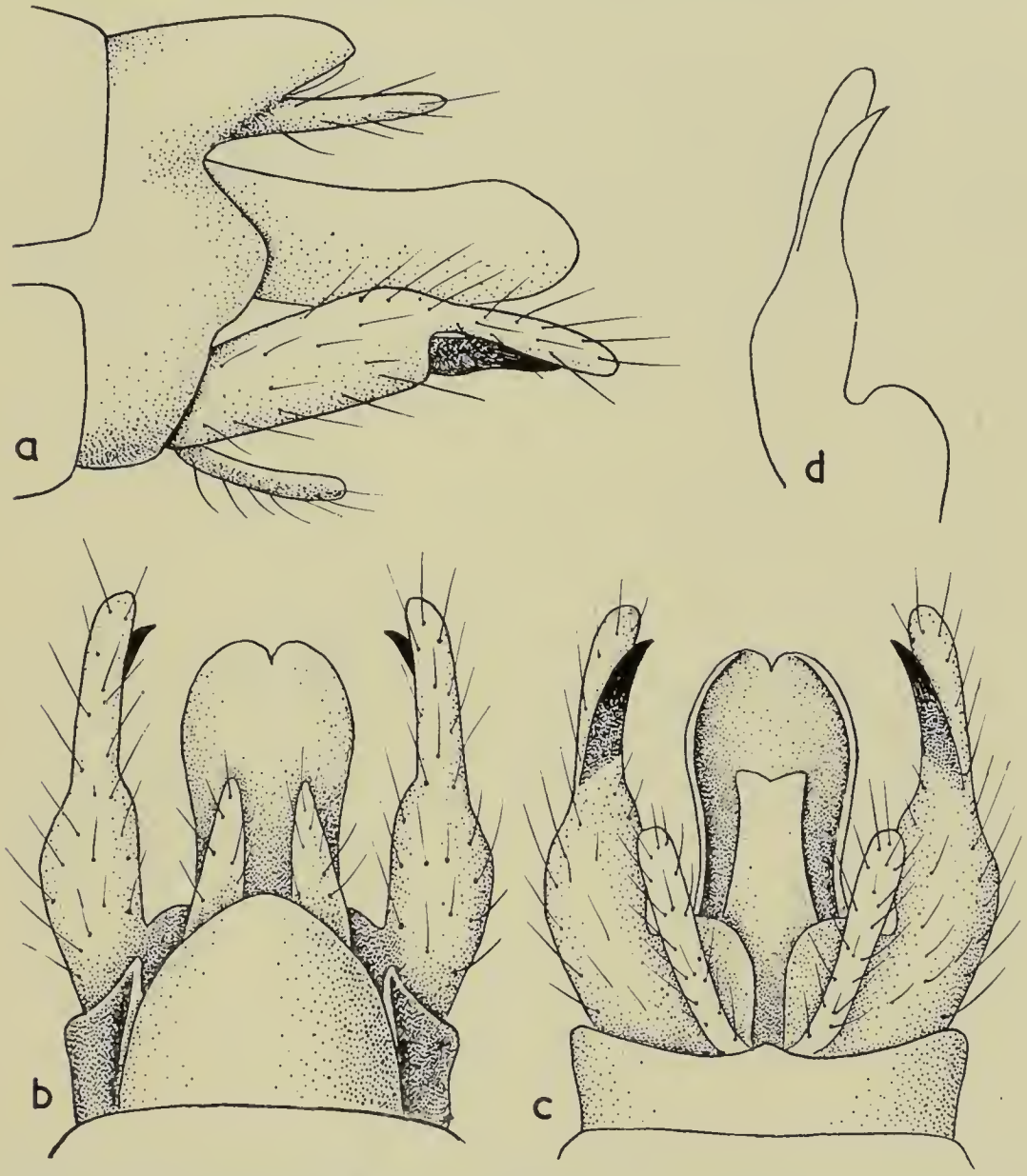

Fig. 139.—*Triplectides gilolensis* (McLachlan). ♂ genitalia. *a*, lateral ; *b*, dorsal ; *c*, ventral ; *d*, inferior appendage, ventral.

To this I add a description of the genitalia :

Genitalia, ♂.—Terminal dorsal segment much produced, so that the apical margin overlaps about the basal half of the superior appendages ; these are longer and more slender, with the apices more acute than those of the average

form of *magna*. Upper penis-cover large, with the apical margin excised at centre and hood-shaped as in *magna* ; apex of the penis excised. Inferior appendages closely resembling those of *magna* but with the notch on the lower surface rectangular rather than obtuse ; second branches nearly as long as

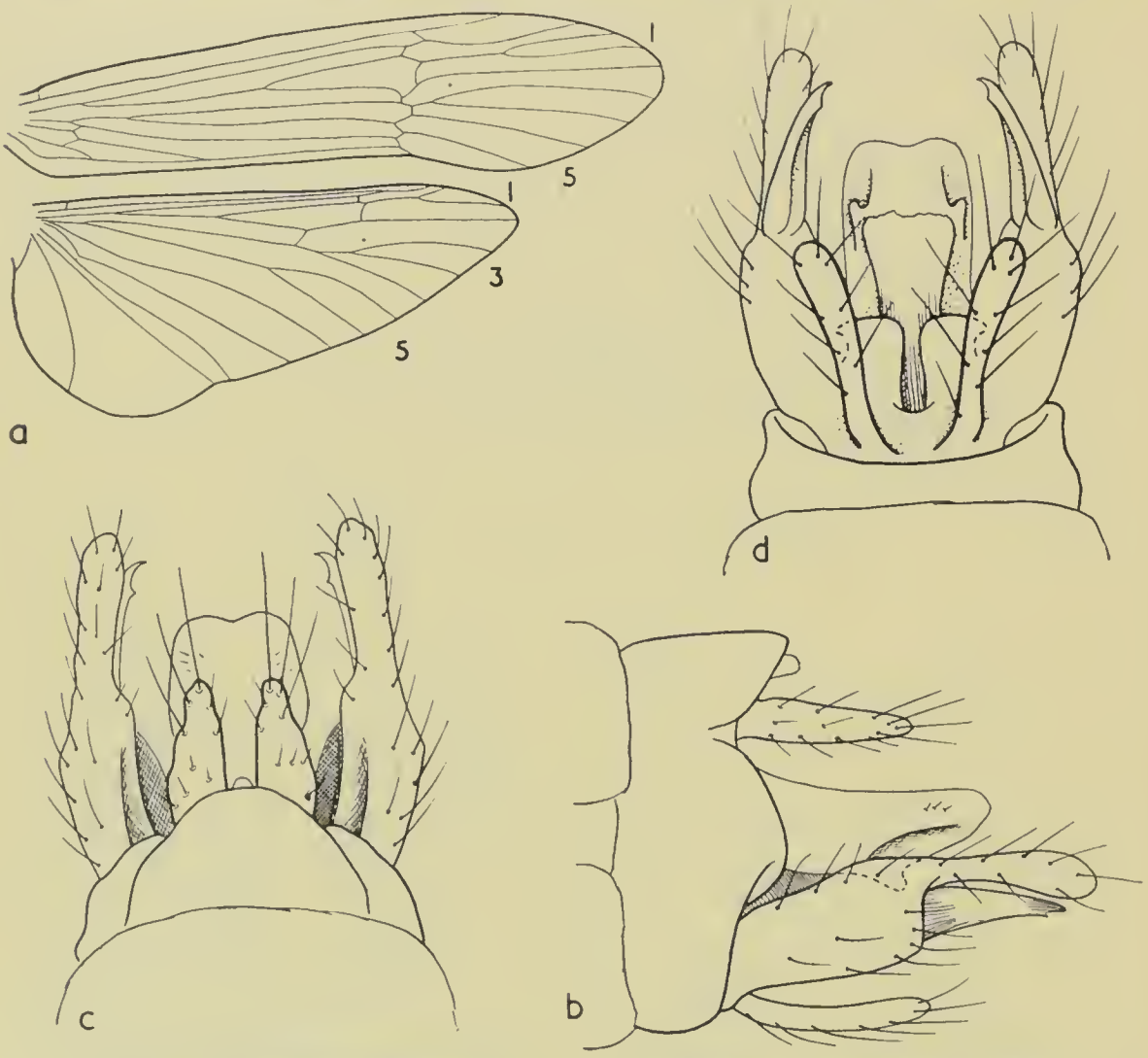

Fig. 140.—*Triplectides ciuska* sp. n. ♂. *a*, wings ; *b*, genitalia, lateral ; *c*, dorsal ; *d*, ventral.

the first. The hooked inner plates at the bases of the appendages are rather more rounded than in *magna* with the hooks at the inner apical angles less pronounced. Basal branches of the appendage rather more slender than in *magna* and the margin of the terminal ventral segment less produced.

In addition to the *type* from Gilolo Island, there are examples in the British Museum (N.H.) from :

Fiji ; New Guinea ; Selangor ; Java ; North Borneo ; Fed. Malay States ; N. Australia ; Philippine Isls. ; India.

In N. Australia it has been taken in December.

Triplectides ciuska sp. n. (fig. 140).

Wings castaneous, only slightly hairy, without the conspicuous clothing of hoary hairs so characteristic of *T. magna* which, in other respects, *ciuska* closely resembles; *antennae* chocolate with white annulations. *Spurs*, 2, 2, 2.

Genitalia, ♂.—From above, the distal margin of the ninth segment is

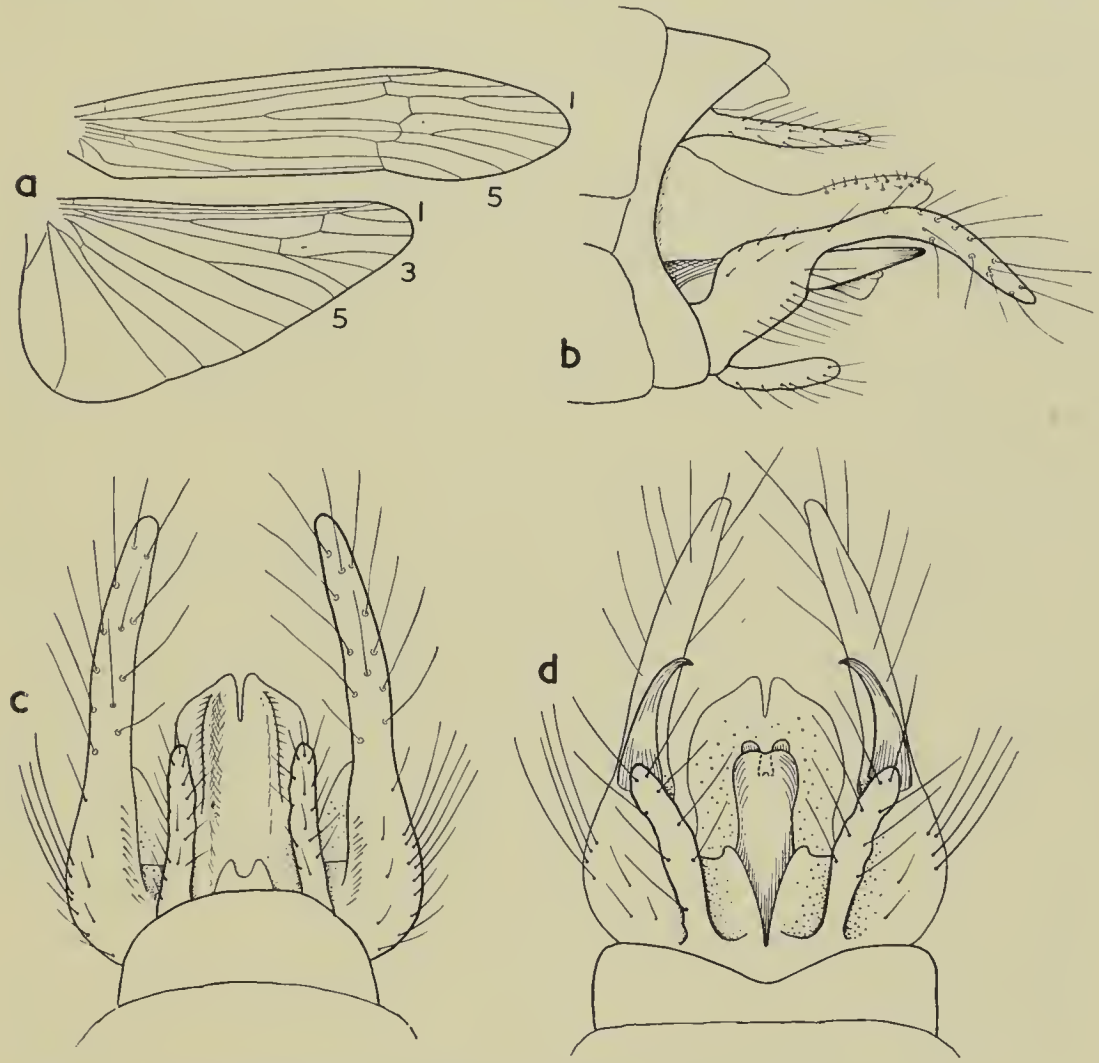

Fig. 141.—*Triplectides similis* sp. n. ♂. *a*, wings; *b*, genitalia, lateral; *c*, dorsal; *d*, ventral.

produced so that the segment appears triangular with a rounded apex, beyond which is a minute, transparent plate. Superior appendages medium in length, spindle-shaped. Upper penis-cover large; distal margin truncate with a slight excision at its centre. Penis membranous with excised apex. Inferior appendages three-branched, stout at the base: upper branch membranous towards its rounded apex; second branch immediately below and slightly shorter than the upper; it is more strongly chitinized and, in the single example available, terminates in a strong claw with a second, much smaller, on the

lower surface just below it ; the third branch arises at the base and is fringed with long, stiff hairs. A pair of inner plates with hooked apices arises from the upper inner margins at the base of the appendages, joined at the base, with a rounded excision between them.

Length of the anterior wing, ♂, 14 mm.

AUSTRALIA : New South Wales, Mt. Kosciusko, 3000 ft., 20.i.1914, 1 ♂ (*type*) ; Queensland, Dunwich, ix.1926, 1 ♂, 1 ♀, Mackerras (C.S.I.R. Coll.).

Type, ♂, in the British Museum (N.H.) ; paratypes, ♂ ♀, in the C.S.I.R. Collection, Canberra.

Triplectides similis sp. n. (fig. 141).

In the ♂, oculi greenish, exceptionally large. *Head*, base of the *antennae*, *palpi* and *fore legs* clothed with short, white hairs. *Wings* castaneous, clothed here and there with white and dark brown hair. In the anterior wing discoidal cell long, scarcely dropping towards the lower distal angle ; fork no. 1 longer than its footstalk. In the posterior, discoidal cell long and fork no. 1 much longer than in *T. magna*, nearly sessile. In this wing the base of fork no. 5 extends basally considerably beyond the cross-vein and nearly as far as the base of the discoidal cell. *Spurs* 2, 2, 2.

Genitalia ♂.—From above, margin of the ninth segment evenly rounded, and from just below its centre there is a minute membranous fork projecting as in *T. cephalotes* ; superior appendages long and slender, nearly as long as the upper penis-cover, which is large with the distal margin excised and with two parallel ridges set with short, stiff hairs extending on each side of the excision towards the base. Penis with the apex excised. There is the appearance of a plate adpressed beneath the penis, also with excised apex, but this may be a ridge on the under surface of the penis. Inferior appendages with the upper branch very long, about twice the length of the lower branch, which terminates in an inturned claw. Third or basal branch about as long as the second. There are the same plate-like extensions of the inner, upper margins that are mentioned in the description of *magna*.

Length of the anterior wing, ♂, 17 mm.

TASMANIA : Deloraine, 27.xii.1884, 1 ♂, McLachlan Coll. (*type*).

AUSTRALIA : 1 ♂, McLachlan Collection.

Triplectides volda sp. n. (figs. 142, 143).

Insect small. *Wings* creamish covered with short, white hairs, amongst which are intermingled brown hairs to give a speckled appearance, especially in the neighbourhood of the radius. *Head* covered with short hair. *Antennae* chocolate with white annulations. *Palpi* and *legs* covered with short, white hair. *Spurs* 2, 2, 2.

Genitalia, ♂.—From above, apical margin of the ninth segment has been destroyed by pests. Superior appendages short and stout, centrally placed and close together. Upper penis-cover rather longer than the superior appendages ; a slit down the centre extends from a small excision of the

distal margin. Penis short and slightly arched. Inferior appendages three-branched ; third branches short, stout and divergent ; first branches rather stout, slightly longer than the second whose apices are armed each with a double claw. The inner plates somewhat rounded and slightly notched rather than hooked at their apices ; all the processes, seen from below, are shrouded with long, fine hairs.

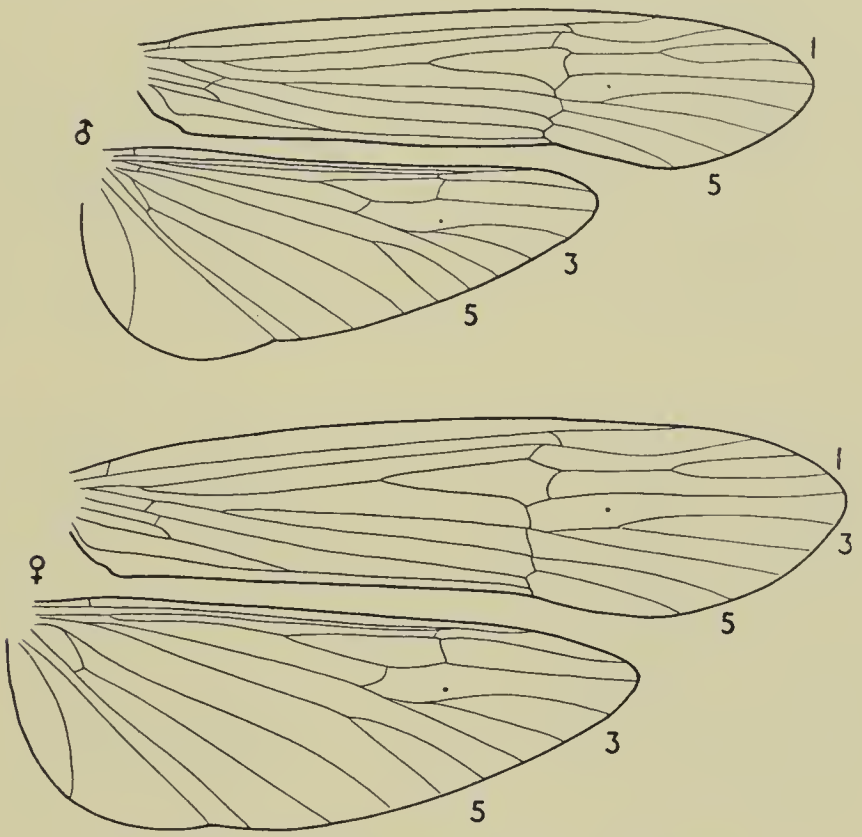

Fig. 142.—*Triplectides volda* sp. n. ♂♀ wings.

Genitalia, ♀.—The eighth segment has been partly devoured by pests, but there are indications that the sides are concave with distal angles somewhat produced. Distal margin of the ninth segment produced, the centre forming a triangular plate and the angles also slightly produced. Below the apex of this triangular plate is a pair of thimble-shaped processes ; below these are two transparent plates with produced inner angles ; from beneath there is a large plate with the distal margin slightly excised at the centre.

Length of anterior wing, ♂, 11·5 mm., ♀, 11 mm.

Australia : Queensland, Eidsvold, x.1926, 2 ♂, 4 ♀, Mackerras (C.S.I.R. Collection). New South Wales, Stanwell Park, 24.xi.1916, 1 ♂, R. J. Tillyard.

Type, ♂ (Eidsvold), in C.S.I.R. Collection, Canberra, paratypes in Canberra and British Museum (N.H.).

Triplectides volda bears a close relationship to *Triplectides ciuska*. It may

be separated by the cream-coloured, speckled wings and the absence of fork no. 1 in the posterior wing. The possibility cannot be dismissed that the species may be Banks' *Triplectides parva*.

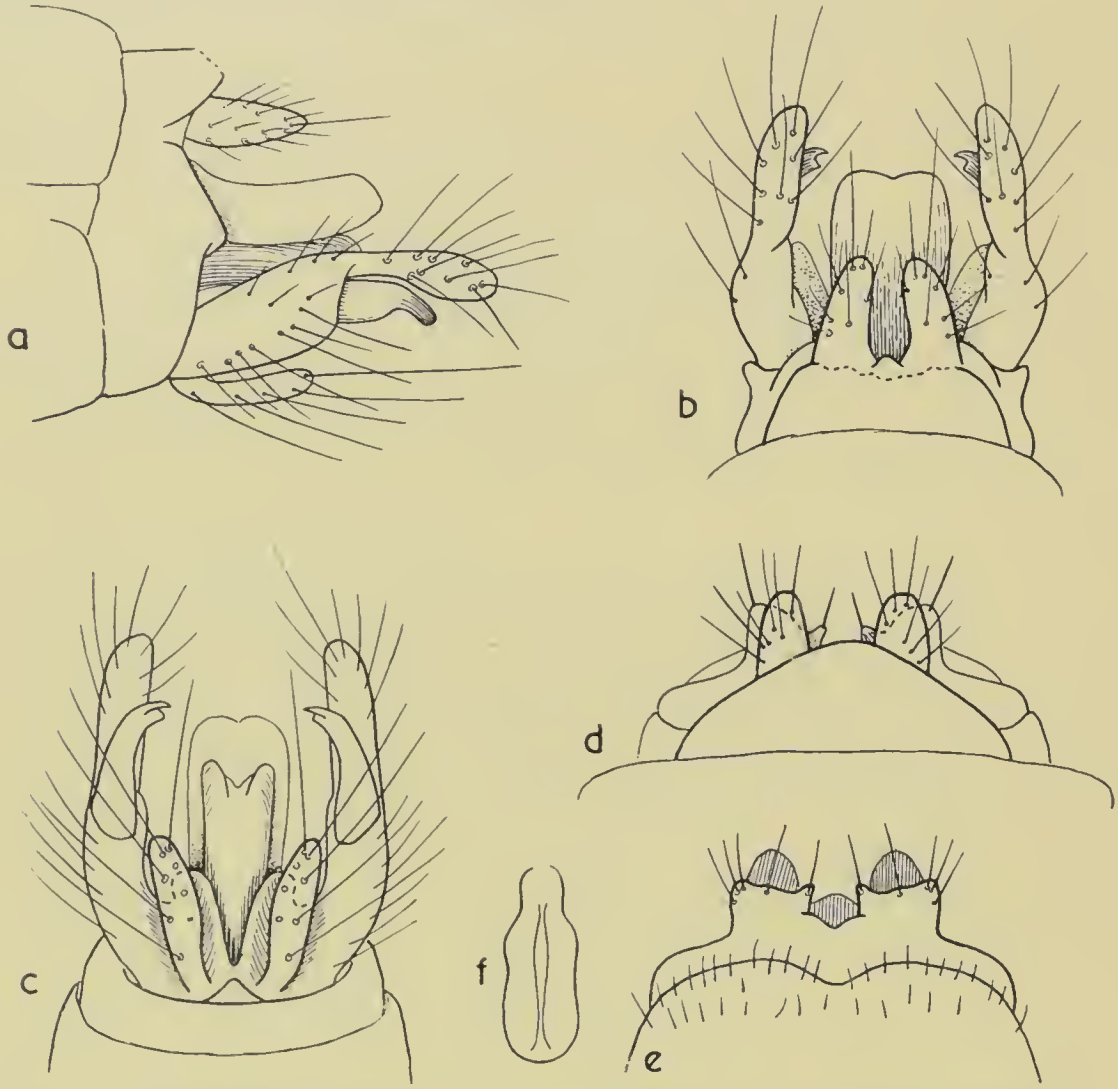

FIG. 143.—*Triplectides volda* sp. n. ♂♀ genitalia. *a*, ♂ lateral ; *b*, dorsal ; *c*, ventral ; *d*, ♀ dorsal ; *e*, ventral ; *f*, vaginal structure, ventral.

Triplectides obsoleta (McLachlan) (fig. 144).

Pseudonema obsoleta McLachlan, 1862, *Trans. ent. Soc. Lond.*, (3) **1** : 305–306.
Pseudonema obsoleta Hagen, 1864, *Verh. zool.-bot. Ges. Wien*, **14** : 876.
Tetracentron sarothropus Bauer, 1865, *Verh. zool.-bot. Ges. Wien*, **15** : 418.
Tetracentron sarothropus Brauer, 1866, *Novara Reise, Neur.* : 12–14, pl. 1, fig. 5.
Pseudonema obsoletum McLachlan, 1868, *Journ. Linn. Soc. Lond. Zool.*, **10** : 212.
Tetracentron sarothropus McLachlan, 1873, *Ann. Mag. n. H.*, (4) **12** : 40.
Pseudonema obsoletum Hutton, 1899, *Trans. N. Zeal. Inst.*, **31** : 240–241.
Pseudonema obsoleta Hudson, 1904, *N. Zeal. Neur.* : 72–75, pl. 10, figs. 1–7.
Triplectides obsoleta Ulmer, 1905, *Ann. Nat. Hist. Hofmus. Wien*, **20** : 71–72.

Tripleetides obsoleta Ulmer, 1907, *Gen. Insect.*, **60a** : 131.
Tripleetides obsoleta Ulmer, 1916, *Ark. f. Zool. Stockholm*, (13) 10 : 17.
Tripleetides obsoleta Tillyar, 1924, *Trans. N. Zeal. Inst.*, **55** : 307.
Triplectides obsoleta Tillyard, 1926, *Ins. Austr. N. Zeal.* : 392.
Pseudonema obsoleta Phillips, 1929, *N. Zeal. Fishery Bull.*, **2** : 12.
Triplectides obsoleta Mosely, 1936, *Trans. R. ent. Soc. Lond.*, **85** : 94–95, figs. 3–7.

McLachlan describes the species as follows :

" *Female.*—Antennae fuscous, narrowly annulated with pale grey ; palpi greyish-fuscous ; head and thorax testaceous, the metathorax paler ; abdomen greyish-brown ; legs grey, tibiae and tarsi blackish ; anterior wings very pale grey, clouded and irrorated with dark grey ; the most conspicuous markings are an oblique, almost obsolete, transverse fascia before the middle, and an indistinct blotch at the pterostigma ; posterior wings semi-opaque, whitish, slightly iridescent."

" Long. corp. 6 lin. ; exp. alar. 17 lin."

" *Habitat*, New Zealand. In Mr. Dale's collection."

The *spurs* are 2, 2, 4. The *type* is a female now in the Hope Department, Oxford University, but the male is well known and I add a description of its genitalia :

Genitalia, ♂.—From above, distal margin of the ninth segment produced in a triangular plate with an acute apex ; there are two small processes set close together under the apex of this plate, but only visible in a balsam preparation. Superior appendages arise from beneath the dorsal plate, rather stout and long, slightly longer than the upper penis-cover which, from above, has a truncate apex and, from the side, a rounded excision on its upper margin towards the base. Penis slender at the base, broadening gradually to a cup-like apex in which are set two rather broad nodules with two black, upwardly pointing hooks between them. From beneath, there is a Y-shaped ridge extending across and slightly behind the lower apical margin. Inferior appendages three-branched : the first branch is deeply angulated along its inner margin at a point rather more than midway towards the apex ; in the angle is set a short and rather wide second branch with a strongly chitinized, bifurcate, claw-shaped apex ; the third branch arises from the lower basal margin of the appendage, as seen from beneath ; it is short, fringed, and extends to the base of the second branch. The inner plates arise from the inner margins of the appendages towards the base and are sinuous, curving towards the penis. Margin of the ninth ventral segment is produced at its centre in a rather wide, triangular process ; ventral margin of the eighth sternite sharply excised at its centre.

The perfect insect occurs from November to March.

Dr. Ulmer has suggested, and I am inclined to agree with him, that *obsoleta* is not a true *Triplectides*. Should more species be discovered with similar characters it might well be desirable to erect a new genus to take them.

Hudson describes the biology of this species as follows :

" The transformations of this peculiar insect are very interesting. The larva, which is found in clear, dashing, forest streams, usually inhabits a piece of twig, through the centre of which it has tunneled out a cylindrical hole. In this simple

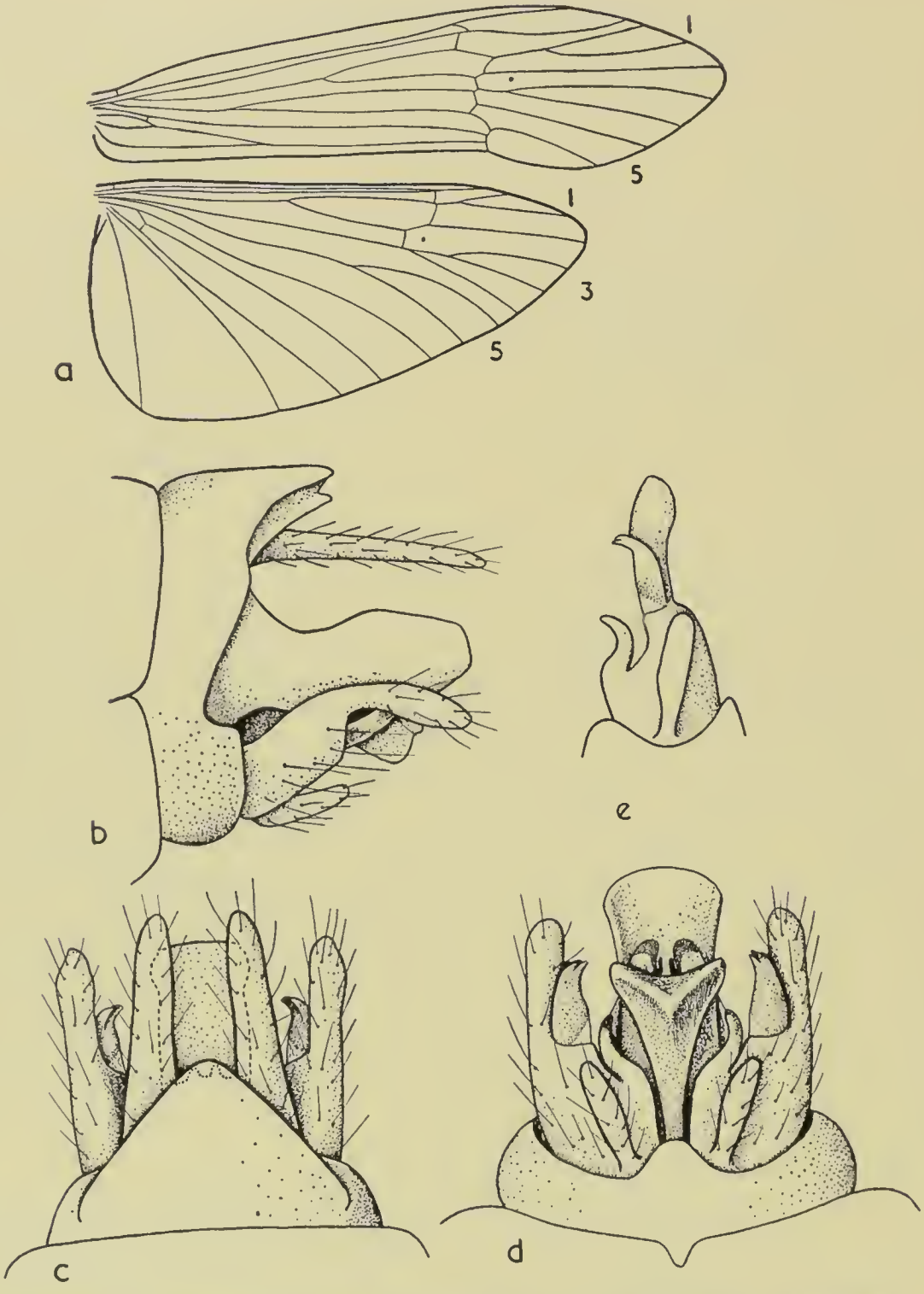

FIG. 144.—*Triplectides obsoleta* (McLachlan). ♂. *a*, wings; *b*, genitalia, lateral; *c*, dorsal; *d*, ventral; *e*, inferior appendage, ventral.

habitation it is enabled to live secure from all enemies, as the stick is always long enough to allow the insect to retreat a considerable distance from the opening at either end. In fact, I have found small larvae inhabiting twigs nearly five inches long. If menaced in any way the larva always remains thus concealed in the middle of the twig, consequently its habitation cannot be distinguished from any other fragment of twig, of which there are usually hundreds floating about in the streams, where the insects abound. When the larva is not apprehensive of any danger it projects its head and thorax from the opening, and proceeds to walk about dragging the stick after it. The presence of a number of these animated twigs, of various shapes and sizes, in a basin of water has a most remarkable appearance. The enclosed insects are not readily seen, and it is thus difficult to account for the singularly rapid movements with which the twigs are endowed. Although this larva usually inhabits a plain stick, hollowed out in the middle, more complicated dwellings are not infrequently constructed by the insect. Fragments of the stems of fern fronds, the green liverworts, which grow so plentifully on the stony banks of many of these forest streams, as well as many other kinds of vegetable remains, are built up by the larva into the most fantastic cases imaginable. In addition the insect frequently employs ordinary fragments of wood from forest trees, which it hollows out in a similar manner to the sticks. The last-named habit proves, I think, that the larva does not select twigs already hollowed out, as I at first supposed, but bores them out to suit its own requirements."

" The food of these larvae consists chiefly of fallen leaves and sodden wood, both of which are present in great quantities in all forest streams. I have actually seen captive specimens feeding on the leaves of *Melicytus ramiflorus*, and on the berries of *Aristotelia racemosa*. The insect is, in fact, very hardy, and can easily be kept in a shallow vessel of water, if it is supplied with a few leaves and twigs from its native stream. The larva may be found in the streams throughout the entire year, but it is most abundant about midsummer."

" When extracted from its singular habitation the larva of *P. obsoleta* is not found to differ widely from many other caddis-worms. The head and first two thoracic segments are rather small, horny, and dark brown in colour ; the two anterior pairs of legs are short, pale yellow barred with dark brown ; the posterior legs are very long, and are chiefly instrumental in moving the larva and its case. They project forwards from the case, and act somewhat as a pair of grappling-hooks. The last thoracic segment is of large size, and has four horny dorsal plates. The first segment of the abdomen is furnished with a very large dorsal hump. All the segments of the abdomen are very large, soft, and yellowish-white in colour. There are seven pairs of respiratory filaments on each side of the larva. The anal hooks are small, and each is situated on a moderately large protuberance. There is a number of stout bristles on the last two segments of the insect."

"As soon as this larva has attained its full size it fastens one end of its habitation securely to a log or other firm object, and closes both of the orifices with a loosely spun silken lid, means thus being provided for the free circulation of fresh water through the case for the use of the enclosed insect whilst it is in the pupa state."

" The pupa is a most beautiful object. Its length is about $\frac{5}{8}$ inch. The jaws are small and prominent, the eyes very conspicuous ; the head and thorax are brown, the abdomen ochreous-yellow. Legs and palpi brown. Respiratory filaments are situated on all the segments of the abdomen, except the last three. The extremely long antennae are carried in two spirals beyond the end of the body."

" The pupa is enclosed in a thin, tough cocoon inside the hollow stick or wooden case, which is firmly attached to a sunken log in the stream."

"The insect remains in this condition for three or four weeks. About twenty-four hours before its final transformation the pupa leaves its old habitation and swims about in the water with considerable rapidity. After this the emergence of the imago

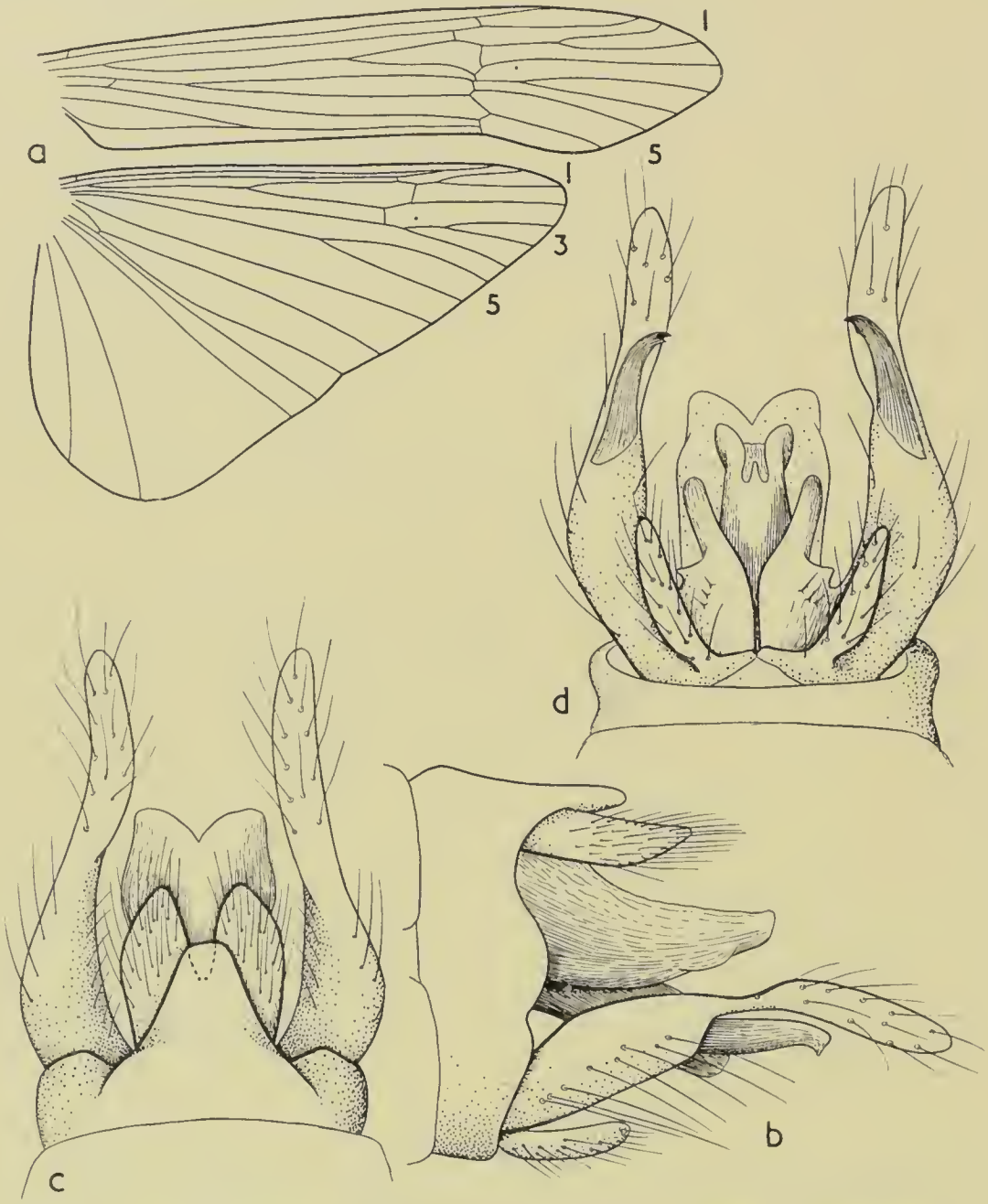

Fig. 145.—*Triplectides niveipennis* sp. n. ♂. *a*, wings; *b*, genitalia, lateral; *c*, dorsal; *d*, ventral.

takes place, but the insect's exact procedure during this operation is not quite clear. Probably the pupa does not leave its native element before emergence, as the empty pupa skin is always found floating on the surface of the water. The perfect insect appears from November till March. It is often common in the vicinity of forest

streams, and may be captured at evening dusk. It flies with a peculiar zigzag flight, but in this respect it is not so remarkable as the next species [*Hudsonema amabilis*.—D. E. K.] It is also attracted by light. I have taken *P. obsoleta* on the Tableland of Mount Arthur, at an elevation of no less than 3600 feet above the sea-level. It is, I think, generally distributed throughout New Zealand, and probably occurs wherever there are dense forests and swift-running streams."

Triplectides niveipennis sp. n. (fig. 145).

Head with a tuft of white hairs between the oculi, which are very large. *Antennae* towards the base ochraceous, faintly ringed with fuscous and clothed with short, white and narrow scales ; beyond, as far as the apex, the joints are dark fuscous annulated with white. *Anterior wing* long and narrow, fuscous, with numerous but not dense white hairs. *Posterior wing* very broad at its base, densely clothed with short, white hairs ; neuration normal for the genus. *Spurs* 2, 2, 4.

Genitalia, ♂.—From above, apical margin of the ninth segment strongly produced, apex truncate. Superior appendages short and broad. Upper penis-cover large, strongly excised at its apex from each rounded apical angle. Penis nearly as long as the cover, apex excised. Inferior appendages three-branched, main branch long and slender, constricted at the usual midway excision, from which arises a rather short second branch with claw-shaped apex, third branch short and arises at the base. The inner plates, arising at the base and beneath, are strongly developed, each with an angular projection towards its base on its outer margin.

Length of the anterior wing, ♂, 14 mm.

W. Australia : Yanchep, N. of Perth, 13–23.xi.1935, 11 ♂, R. E. Turner.

Type mounted as a microscope preparation.

This species may be readily distinguished by the snow-white clothing and greater breadth of the posterior wings.

Triplectides tambina sp. n. (fig. 146).

Head and *body* reddish fuscous, clothed with brown hairs. Oculi black. *Legs*, *antennae* and *wings* all reddish fuscous. Anterior wing with an area between the subcosta and the radius brownish, making a broad stripe along the wing, visible even when denuded. Vestiture consisting of short, brown hairs without any intermingling of whitish. Discoidal cell very broad at the distal end, the broadening being caused by an unusually deep extension of the lower distal angle, so that the vein bordering the lower margin of the cell at this point is in contact with the media, the sixth apical sector passing very close to the point of contact. In the *posterior wing* the cell below fork no. 3 has a short footstalk. *Spurs* 2, 2, 4.

Genitalia, ♂.—From above, distal margin of the ninth segment produced and pointed, with two minute, transparent, finger-like processes partly concealed beneath the extreme apex. Superior appendages short, narrow and

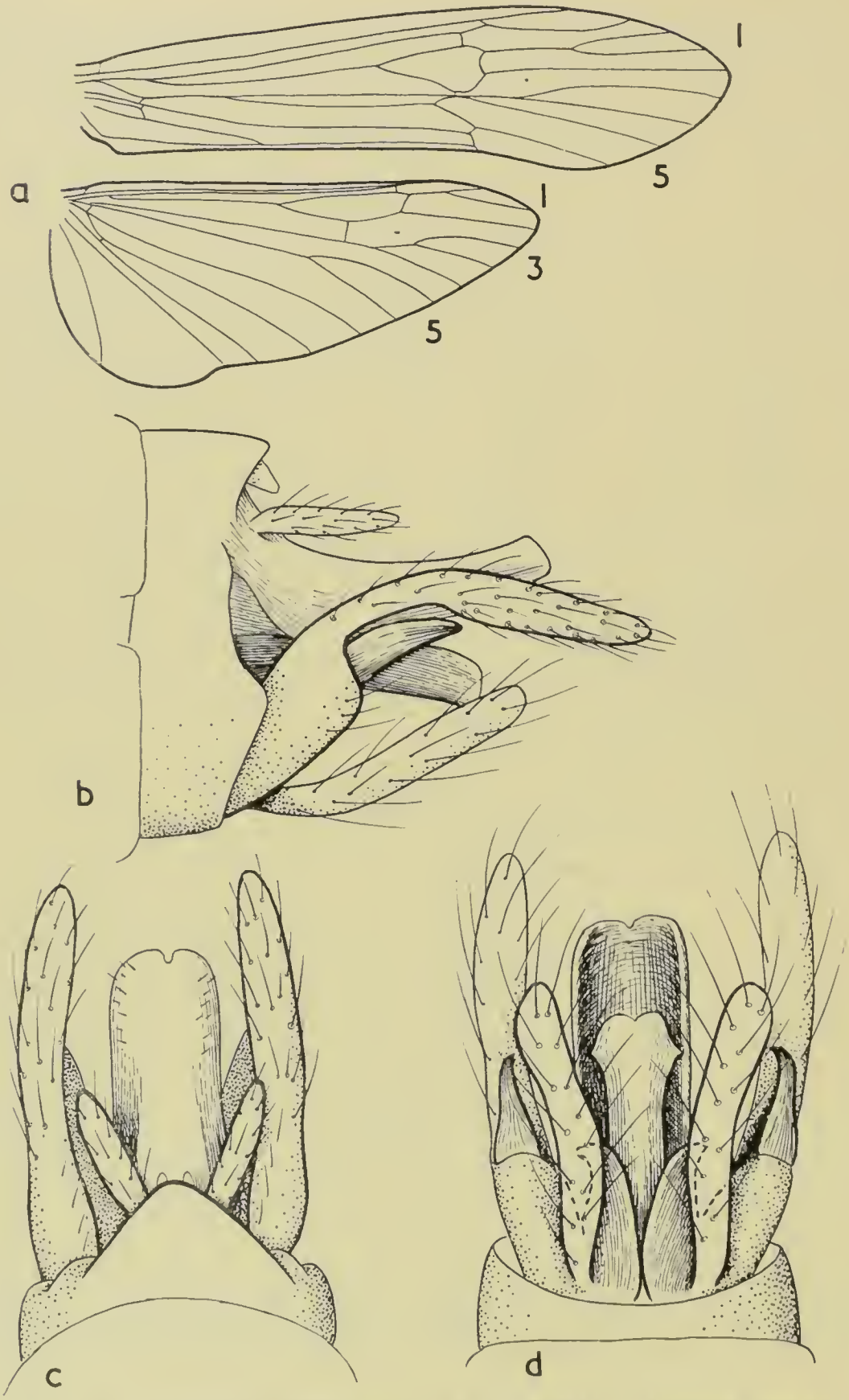

FIG. 146.—*Triplectides tambina* sp. n. ♂. *a*, wings; *b*, genitalia, lateral; *c*, dorsal; *d*, ventral.

divergent. Upper penis-cover large, rectangular, apex minutely excised. Penis long, apex slightly dilated with a pair of lateral spurs, apical margin excised. Inferior appendages three-branched ; main branch very long, from the side with a right-angled excision towards the base ; in the excision is set a very short second branch, apex claw-shaped and incurved from beneath ; third branch, which arises on the lower surface at the base, nearly as long as the upper penis-cover ; inner plates short, with out-turned apices.

Length of the anterior wing, ♂, 11 mm.

AUSTRALIA : S. E. Queensland, Tambourine Mts., 11–18.iv.1935, 1 ♂, R. E. Turner (*type*) ; New South Wales, Stanwell Park, 22.iv.1916, 1 ♂, R. J. Tillyard.

T. tambina differs from *T. obsoleta* McLachlan in its shorter superior appendages, and from *T. dubius* sp. n. in its shorter fork no. 1 in the posterior wing.

Triplectides dubius sp. n. (fig. 147).

Insect large, castaneous. *Antennae* dark ochraceous, with no annulations. *Head, thorax, palpi* and *legs* clothed with dark brown hair. *Wings* clothed with short, brown hair. *Spurs* 2, 2, 4.

Triplectides dubius closely resembles *Triplectides tambina*. The main difference lies in the *neuration*. In the latter species the discoidal cell of the anterior wing is shorter and broader in the distal area ; in the posterior wing the cell below fork no. 3 is sessile. There are other slight differences which will be appreciated on a comparison of the figures. In the *genitalia* the pattern of the two species is so much alike that a mere description would be scarcely adequate to convey the distinctions between them. I will therefore make a comparative description here, the points of difference being as follows :

In *dubius* the dorsal margin of the ninth segment is broadly rounded, in *tambina*, triangularly produced ; in the former species the upper penis-cover is a little longer and much more slender than in the latter ; in *tambina* there are lateral projections before the apex of the penis, absent in *dubius* ; the inferior appendages in *dubius* are longer and more slender than in *tambina*, with the inner marginal plates broadly triangular and not hooked at their apices ; the basal branch is shorter than the median in *dubius* but longer in *tambina*.

Length of the anterior wing, ♂, 14 mm.

TASMANIA : Cradle Mts., 18.i.1917, 2 ♂, R. J. Tillyard.

Triplectides dubius Mos. var. **subalbidus** nov. (Kimmins).

Genitalia indistinguishable from the typical form. This variety is separated by the white hairs on the head and thorax, and a sprinkling of yellowish white hairs on the anterior wing, tending to form irrorations.

AUSTRALIA : New South Wales, Hampton, i.1918, 1 ♂ (*type*) ; Adaminaby, 21.x.1918, 1 ♂, 2 ♀, R. J. Tillyard.

Fig. 147.—*Triplectides dubius* sp. n. ♂. *a*, wings; *b*, genitalia, lateral; *c*, dorsal; *d*, ventral.

Triplectides varius sp. n. (Kimmins) (figs. 148, 149).

♂. *Spurs* 2, 2, 4. *Head* dark brown, clothed with white hairs, with which are intermingled some blackish hairs. *Antennae* with basal and second joints dark brown, with white hairs, remaining joints fulvous, not annulated. *Palpi* dark brown, with dark brownish and grey hairs. *Thorax* dark brown, with whitish hairs. *Legs* fuscous, with whitish pubescence. *Anterior wing* fuscous, neuration brown : membrane with reddish brown and white pubescence, the white hairs forming an irregular mottling, and with a suggestion of transverse banding beyond the anastomosis. *Posterior wing* pale fuscous, with sparse golden-brown pubescence. Neuration following the pattern of *T. tambina* and *T. dubius*. Discoidal cell rather short and broad, the lower

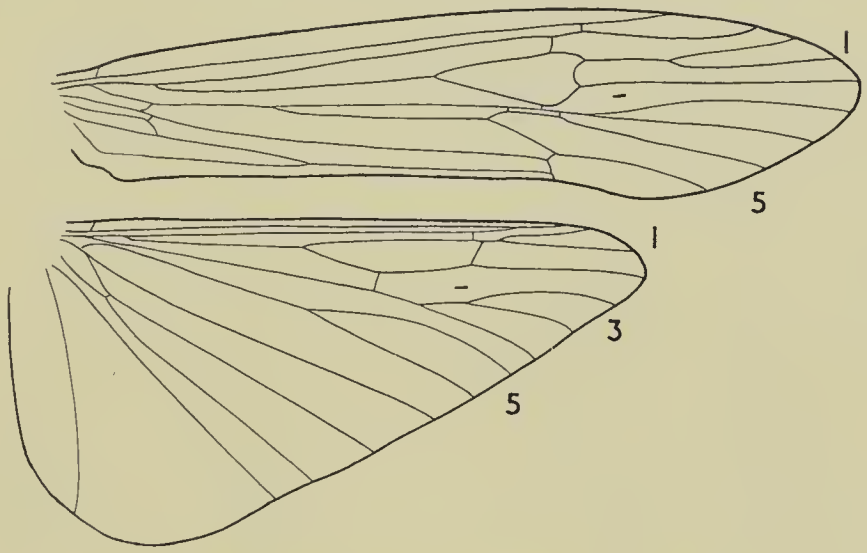

Fig. 148.—*Tripleetides varius* sp. n. ♂ wings.

distal angle, the media and the anterior branch of the upper cubitus all closely approximated, causing the thyridial cell to be very narrow. Fork no. 1 a little longer than its footstalk ; apex of the wing rather pointed. Posterior wing rather broad at the base, fork no. 1 with a short footstalk ; fork of the media well distal from the cross-vein below the discoidal cell, fork no. 5 extending basally almost to the base of the discoidal cell.

Genitalia.—Dorsal margin of ninth segment truncate ; superior appendage slender, about half as long as upper penis-cover. The latter is narrow, truncate at its apex, with a minute median excision, the lateral margins towards the apex somewhat out-turned to form flanges. Penis slender, slightly arched ; upper apical margin produced in a pair of short, rounded fingers. Apex from beneath slightly dilated, from the side excised. Inferior appendages with the main branch slender, bent downwards and about twice as long as the basal part. Second branch short, claw-like. Third branch rather unusually long and slender, from beneath incurved. Inner plates large, with broad

truncate apices, separated from the appendage by a small excision, but not hooked. Ventral margin of the ninth segment slightly produced at its centre.

Length of anterior wing, 16 mm.

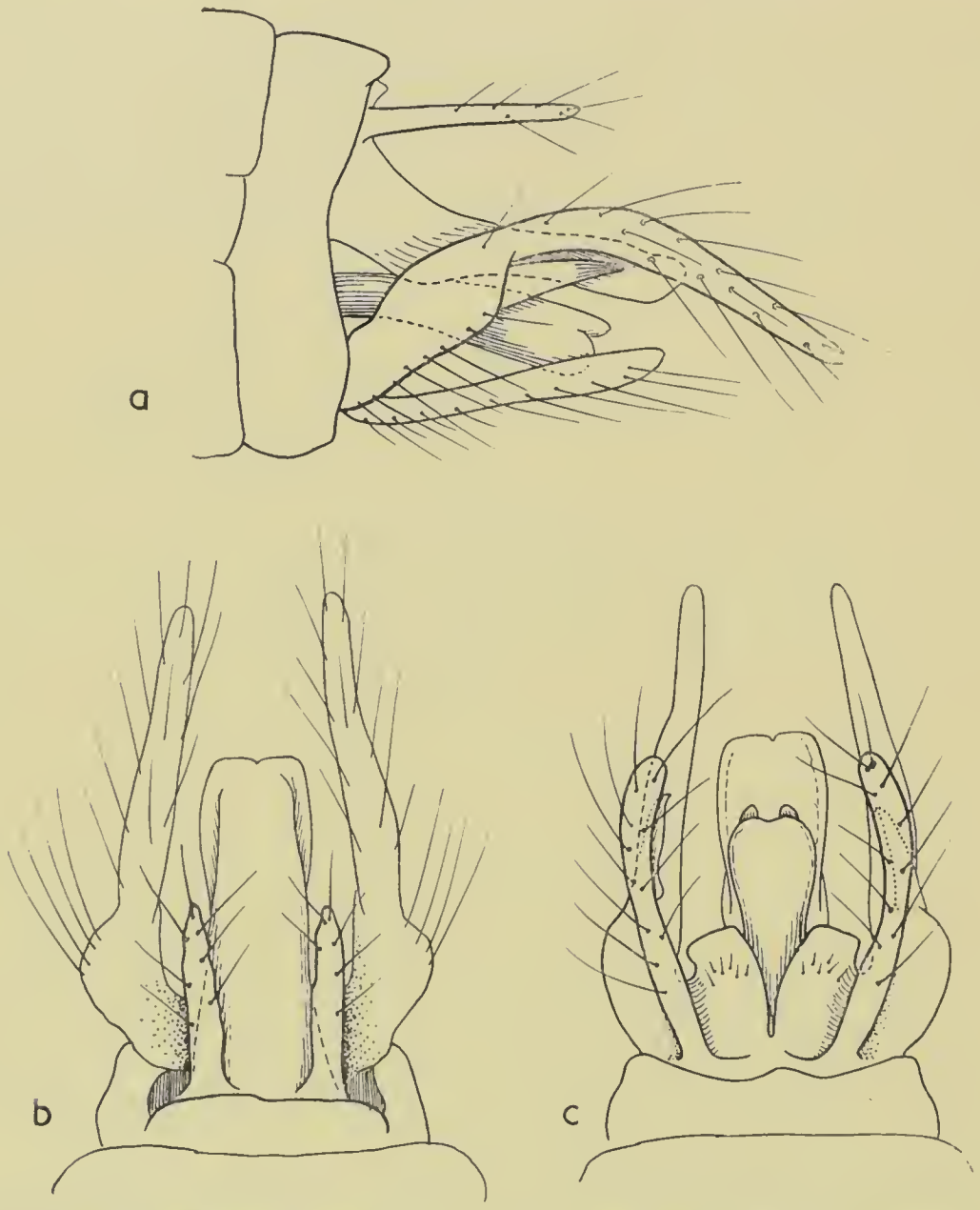

Fig. 149.—*Triplectides varius* sp. n. ♂. *a*, genitalia, lateral; *b*, dorsal; *c*, ventral.

Australia: New South Wales, Mt. Kosciusko, 5000 ft., 6.xii.1921, 1 ♂ (*type*), 31.xii.1921, 1 ♂, R. J. Tillyard.

This species, with *tambina* and *dubius*, form a group within the genus, characterized by the form of the discoidal cell of the anterior wing. It is distinguished from *tambina* by its larger size, white hairs on the head, white

mottling of the anterior wing, broader anterior wing and more slender inferior appendages. From *dubius* it may be separated by its broader upper penis-cover, which is not cleft at the apex. The approximation of the discoidal cell, media and upper cubitus suggests a link with the genus *Triplectidina*. In that genus, however, the approximation of the media and upper cubitus has reached the stage of complete extinction of the thyridial cell.

Triplectides albana sp. n. (figs. 150, 151).

Spurs 2, 4, 4. *Head* and *thorax* black, clothed with brown and white hair, the white predominating. *Antennae* unicolorous, dark ochraceous. *Legs* and *palpi* ochraceous, clothed with short, white hair. *Wings* narrow, fulvous and unicolorous ; anterior with the base of the cellula thyridii extending only

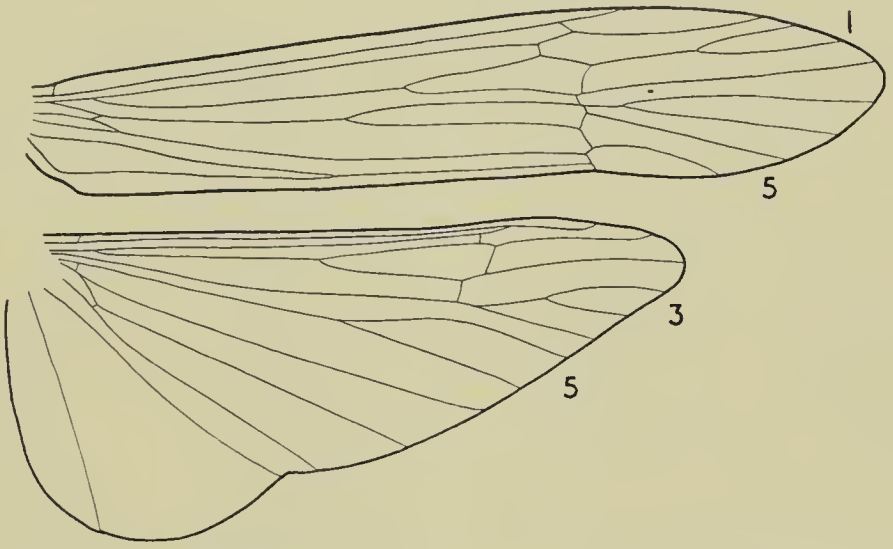

Fig. 150.—*Triplectides albana* sp. n. ♂ wings.

slightly beyond the base of the discoidal cell ; in the posterior wing fork no. 1 wanting, the cell below fork no. 3 with a short footstalk. Base of fork no. 5 extending well beyond the cross-vein below the discoidal cell ; lower margin rather deeply excised towards the base.

Genitalia, ♂.—From above, the centre of the margin of the ninth segment produced in a transparent triangle. Superior appendages small, wide, leaf-shaped ; distal margins furnished with one or two long hairs. Upper penis-cover very short, apex excised ; a fringed wart on each side at the base near the bases of the superior appendages ; from the side, it curves slightly upward and is hood-shaped. Penis obscure. Lower penis-cover wide ; lateral distal angles acutely produced. Inferior appendages four-branched : main branch arising from a rounded base and bearing some strong teeth on its under-surface towards the apex ; median branch arises about midway, short and cylindrical ; there are two basal branches side by side, outer branch pointed, its apex reaching to the apex of the rounded base, the inner branch slightly shorter,

apex rounded and set with four very broad pegs. The inner plate of the appendages short and triangular.

Length of the anterior wing, ♂, 10·5 mm.

W. Australia : Albany, 4.xii.1886, 1 ♂, from the McLachlan Coll.

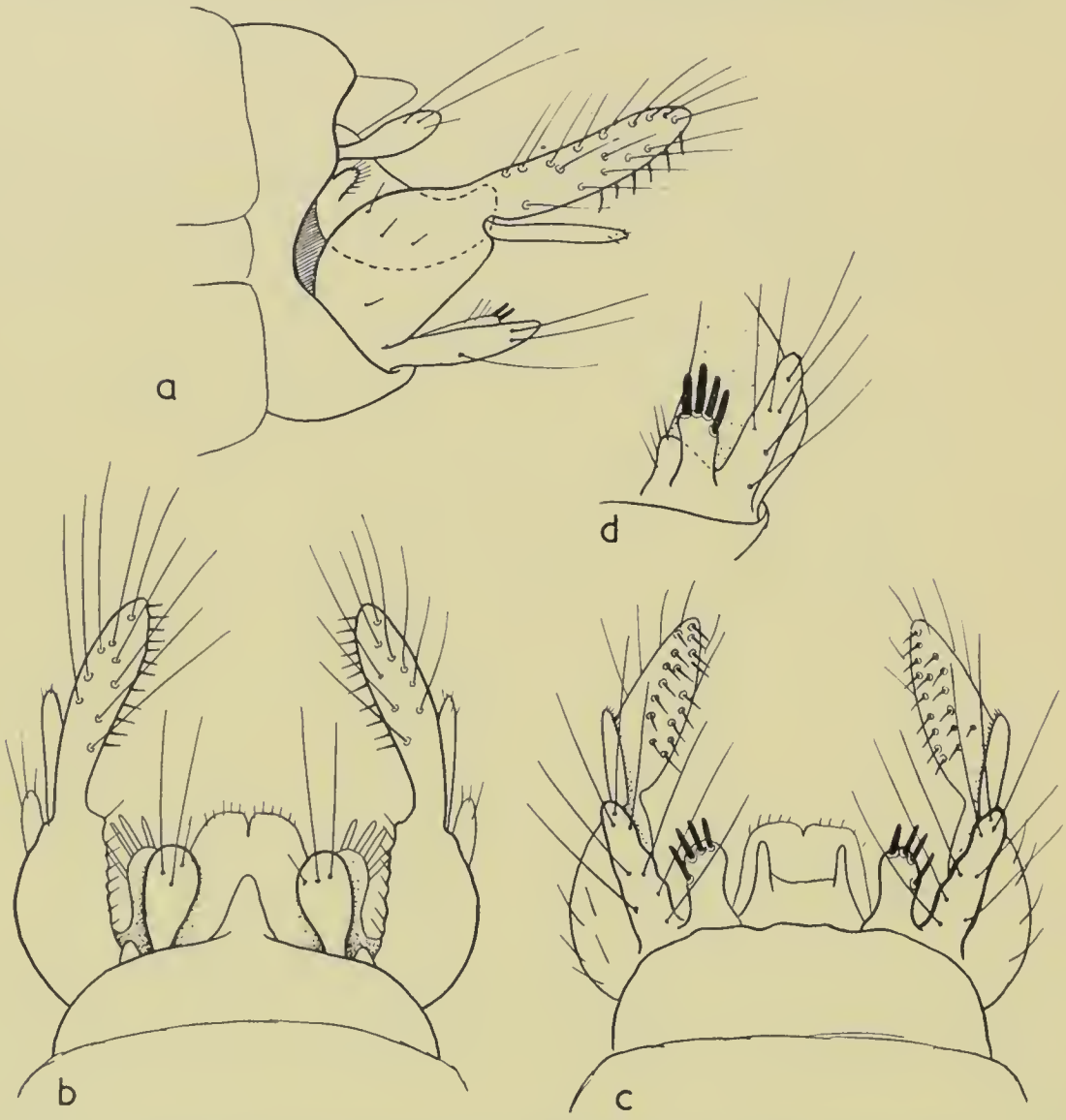

Fig. 151.—*Triplectides albana* sp. n. ♂ genitalia. *a*, lateral ; *b*, dorsal ; *c*, ventral ; *d*, inferior appendage, oblique ventral view to show inner plate.

While the shape of the discoidal cell of the anterior wing of this species indicates that it belongs to the genus *Triplectides*, the pattern of the genitalia is very unusual. Attention is drawn to the extra branch at the base of the inferior appendages, the presence of a lower penis-cover in addition to the inner plates of the appendages which, in some of the other species, I have suggested may function as this organ, and to the pair of hairy warts at the base of the upper penis-cover.

Triplectides australica Banks (fig. 152).

Triplectides australica Banks, 1939, *Bull. Mus. Comp. Zool. Harv.*, 85 : 486, figs. 47, 66.

Banks describes the species as follows :

" Body yellowish gray, head, thorax above, and legs with mostly white hair ; antennae pale, narrowly annulate with black at tips of joints. Wings with white, yellowish, and black hair in patches, much as other species, in male hind wings darker than fore wings."

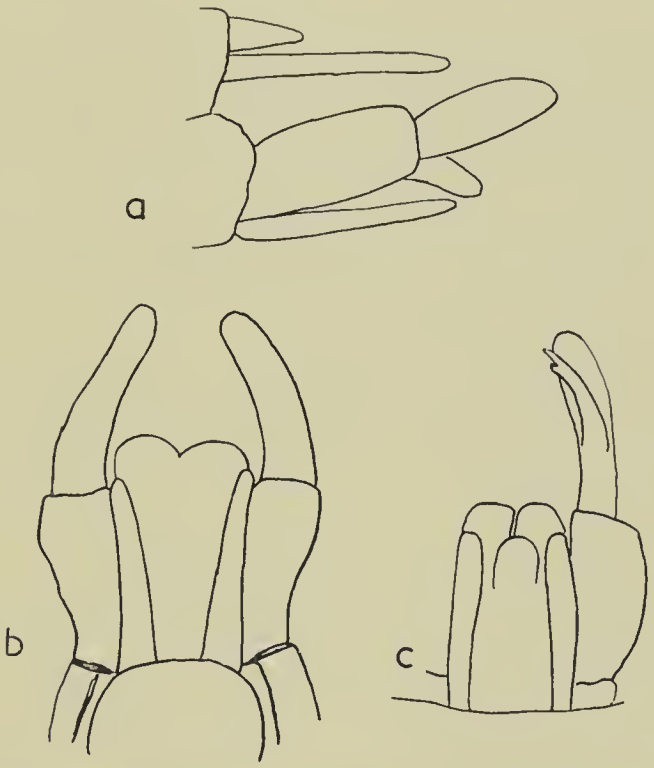

Fig. 152.—*Triplectides australica* Banks. ♂ genitalia (after Banks). *a*, lateral ; *b*, dorsal ; *c*, ventral.

" Fore wings with venation similar to *flava*, but fork one is much longer than its pedicel, and fork three reaches almost to the cross-vein ; in hind wings fork one is present, and the other forks behind are longer than in *flava*. Male genitalia have a pair of slender superior appendages, the lateral ones are large, but not very long, the apical part hardly longer than the basal, and, seen from beneath, shows a process with sharp point (similar to that in *Notanotolica*) ; the median process is broad and slightly bilobed at tip."

" Fore wings 12 to 13 mm. long."

" From Ravenshoe, Atherton tableland, Queensland, Australia, 2000 ft., 27 April (Darlington)."

Type in the Museum of Comparative Zoology, Harvard College, U.S.A.

Triplectides (?) australis Navás.

Triplectides australis Navás, 1934, *Brotéria, Ci. nat.*, 3 : 93–4.
Triplectides (?) *australis* Mosely, 1936, *Trans. R. ent. Soc. Lond.*, 85 : 125.

Navás' description is as follows :

" Caput fuscum, albo pilosum, oculis fuscis ; palpis fuscis, albo pilosis ; antennis fuscis, apice articulorum albo anguste annulato.

" Thorax fuscus, albo pilosus, metanoto testaceo (♂) vel testaceo-ferrugineo (♀).

Abdomen fusco-ferrugineum, appendicibus fulvis, fulvo pilosis : cereis ♂ cylindricis, superioribus horizontalibus, inferioribus adscendentibus, longioribus.

" Pedes fulvi, fulvo pilosi, apice tibiarum et articulorum tarsorum fusco ; calcaribus fulvis.

"Ala anterior apice parabolico, angusta, margine posteriore citra stigma leviter concavo ; reticulatione et pubescentia plerumque fuscis, maculis parvis pallidis leviter conspersa ; cellula discali longa, subaequali (♂) vel multo breviore (♀) suo pedunculo ; furca apicali 1 sesquilongiore suo pedunculo ; furcis ita longitudine crescentibus : 5, 1, 3.

Ala posterior reticulatione fulva, pubescentia rara et fimbriis densis fuscis ; furca apicali 1 longiore (♂) vel subaequali (♀) suo pedunculo, 3 breviore prima et quinta.

Long. corp. ♂ 6·5 mm., ♀ 10·4 mm.
,, al. ant. ♂ 11·0 mm., ♀ 14·3 mm.
,, al. post. ♂ 8·6 mm., ♀ 11·0 mm.

Patria. Australia : Sydney, Coll. Luddemann. Mus. Berlin-Dahlem."

I am unable to recognize this species from the description, in which no figures are included. It is uncertain to which genus it belongs.

Triplectides elongata Banks (fig. 153).

Triplectides elongata Banks, 1939, *Bull. Mus. Comp. Zool. Harv.*, 85 : 486, fig. 39.

Banks describes the species as follows :

" Body dark, head with white hair, and some black ; palpi with mostly black hair, antennae brown, narrowly annulate with black. Wings gray, with gray and whitish hair, and some black especially along the veins. In fore wings the discal cell wider than in *delicatula*, fork one shorter than pedicel, fork three with a pedicel one fourth its length ; in hind wings the fork one is present and the other forks longer than in *delicatula* or *flava*."

" Male appendages show the usual parts very slender ; superior appendages very long, but the ventral ones still longer, the lateral with a long curved piece and a slender apical part full as long, the basal piece below has a row of very long bristles arising from tubercles ; the median piece is long, slender, bilobed, the lobes down and incurved."

" Fore wing 14 mm. long."

" From Blackheath, Blue Mts., New South Wales, Australia, 21 Jan., 8000 ft. (Darlington)."

Type in the Museum of Comparative Zoology, Harvard College, U.S.A.

Banks compares *elongata* with Ulmer's *Notanatolica delicatula* and *N. flava*. It should be pointed out that, judging from the description and figure, the

former species differs widely from Ulmer's, which are now separated generically from *Triplectides* on characters of genitalia and neuration.

Triplectides parva (Banks) (fig. 154).

Notanotolica parva Banks, 1939, *Bull. Mus. Comp. Zool. Harv.*, **85** : 485, figs. 4, 62.

Banks describes the species as follows :

" Dark gray, mottled with pale ; antennae of male dark, narrowly annulate with white ; face with white hair, but a row of black close to eye. Fore wings

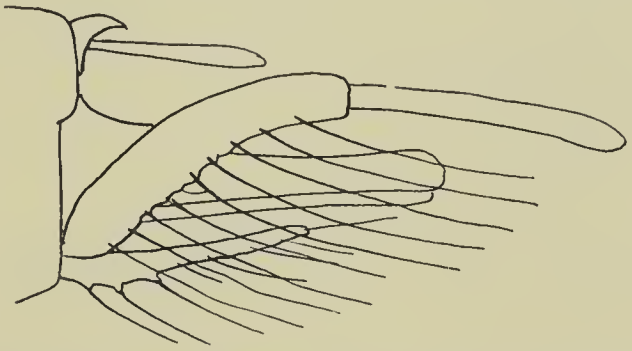

Fig. 153.—*Triplectides elongata* Banks. ♂ genitalia, lateral (after Banks).

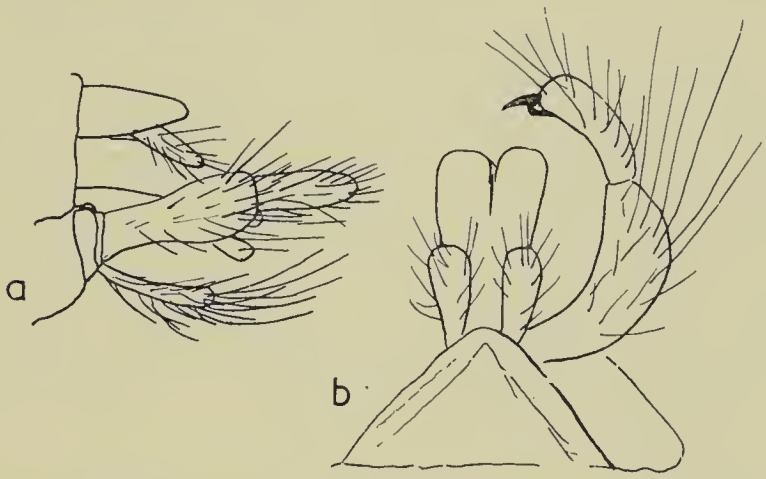

Fig. 154.—*Triplectides parva* (Banks). ♂ genitalia (after Banks). *a*, lateral ; *b*, dorsal.

with black, brown, and white hair in patches and streaks similar to *N. magna*. Venation also very similar to that species, the apical area beyond the anastomosis is very long ; fork one hardly longer than pedicel, fork three with short pedicel, the cell above very wide at base."

" It differs in the smaller genitalia, and in that the apical part of the claspers is shorter than in *magna* and the lower, smooth, pointed process reaches to the tip of the apical part, and can be seen from above ; the superior, bristly appendages are narrower than in *magna*, and the triangular plate at base larger, or more exposed."

" Fore wing, 13 mm. long."

"From Ravenshoe, Atherton tableland, Queensland, Australia, 3000 ft., 27 April (Darlington)."

Type in the Museum of Comparative Zoology, Harvard College, U.S.A.

Triplexa gen. n.

Spurs 2, 2, 2. *Anterior wing*, discoidal cell very long and narrow. Fork no. 1 very long and narrow; fourth apical cellule extending nearly to the cross-vein; fork no. 5 extending considerably beyond the cross-vein. *Posterior wing* with the neuration scarcely differing from the *Hudsonema* pattern. Pattern of *genitalia* differing considerably from that of *Hudsonema*, and not so much from that of *Triplectides*.

Type species.—*Triplexa villa* sp. n.

Triplexa villa sp. n. (figs. 155, 156).

Insect light castaneous, *wings* covered with short, fuscous hair.

Genitalia, ♂.—From above, margin of the ninth segment produced at its centre, where it bears a small tuft of long bristles. Superior appendages very long and slender. There is a wide and deep upper penis-cover; distal margin truncate, excised at its centre. At the sides of the excision are two small, pointed processes with smaller truncate processes at each angle. From the side there is a short, upcurved hook arising about midway along each lower, lateral margin. Penis directed slightly downward, apex excised; on each side is a sheath with a hammer-headed apex. Inferior appendages, from the side, with the basal part very large and stout, trangular, presenting distally an obliquely truncate margin. From about the middle of its upper side the appendage is produced considerably to a dilated apex whose inner surface is covered with short spines, the whole appendage extending as far as the apices of the superior appendages. The basal part, at its apex, terminates in a short spur, and at the base of the produced portion is a rounded, hairy lobe. Within the angle formed by the produced apex and the basal part of the appendage can be seen, in lateral aspect, a small, triangular, claw-shaped branch or joint.

Genitalia, ♀.—Ninth segment with its dorsal suface sloping downward: apical margin produced in a rounded lobe. On each side of this lobe arises a conical hairy appendage. Beneath the rounded lobe is a triangular plate. Ninth sternite divided ventrally by a membranous, longitudinal furrow, at the bottom of which is a narrow chitinous rod or rib, and with a membranous area towards each lateral margin. Vaginal structure somewhat sagittate in ventral aspect, the apex of the arrow directed basally. In side view the haft of the arrow-head is bent back upon itself to form a hook.

Length of the anterior wing, ♂, 9·5 mm.; ♀, 8 mm.

AUSTRALIA: Queensland, Montville, 13-14.iii.1920, 3 ♂, 1 ♀.

Type, ♂, with abdomen mounted in balsam.

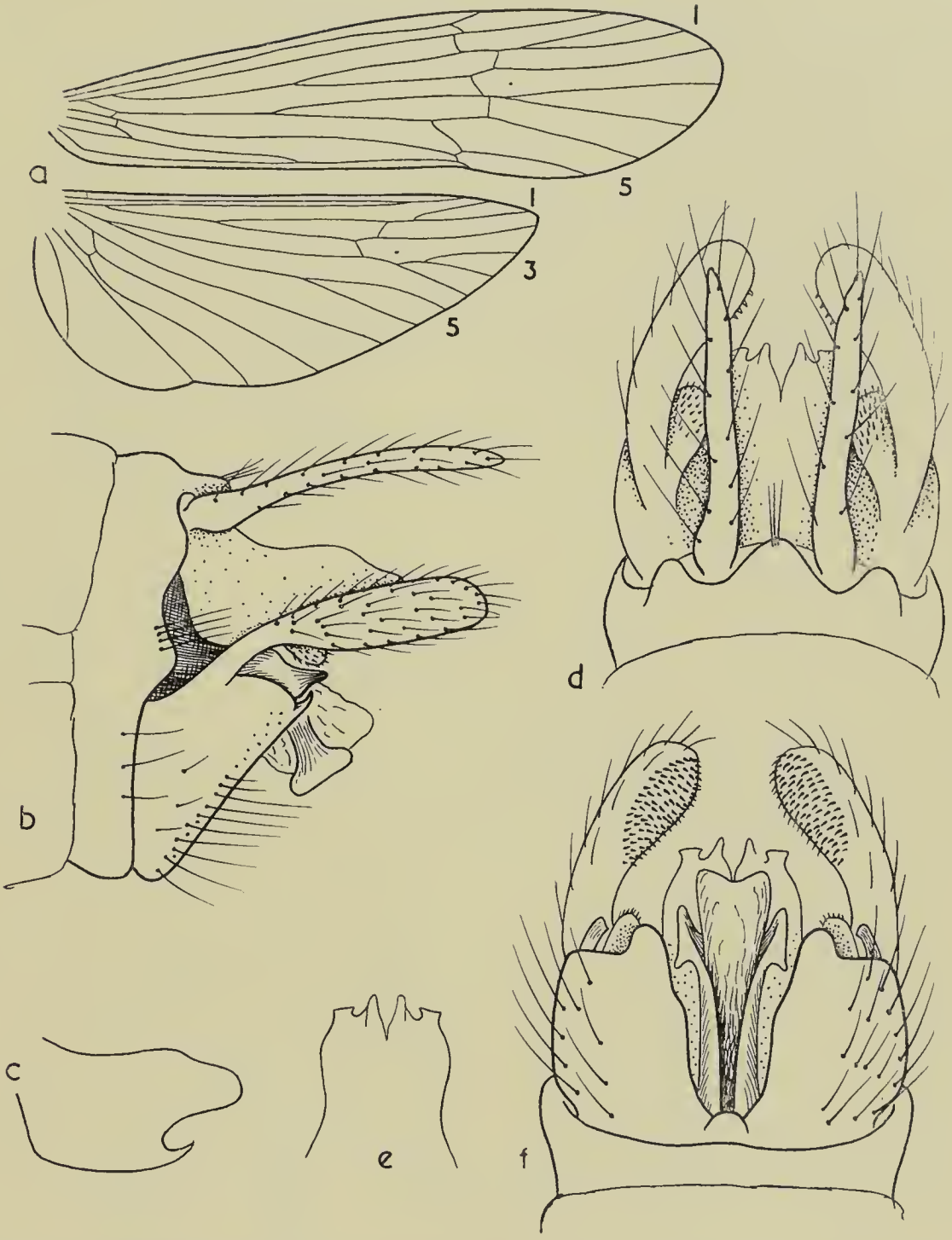

FIG. 155.—*Triplexa villa* gen. sp. n. ♂. *a*, wings; *b*, genitalia, lateral; *c*, upper penis-cover, lateral; *d*, genitalia, dorsal; *e*, upper penis-cover, dorsal; *f*, genitalia, ventral, superior appendages omitted.

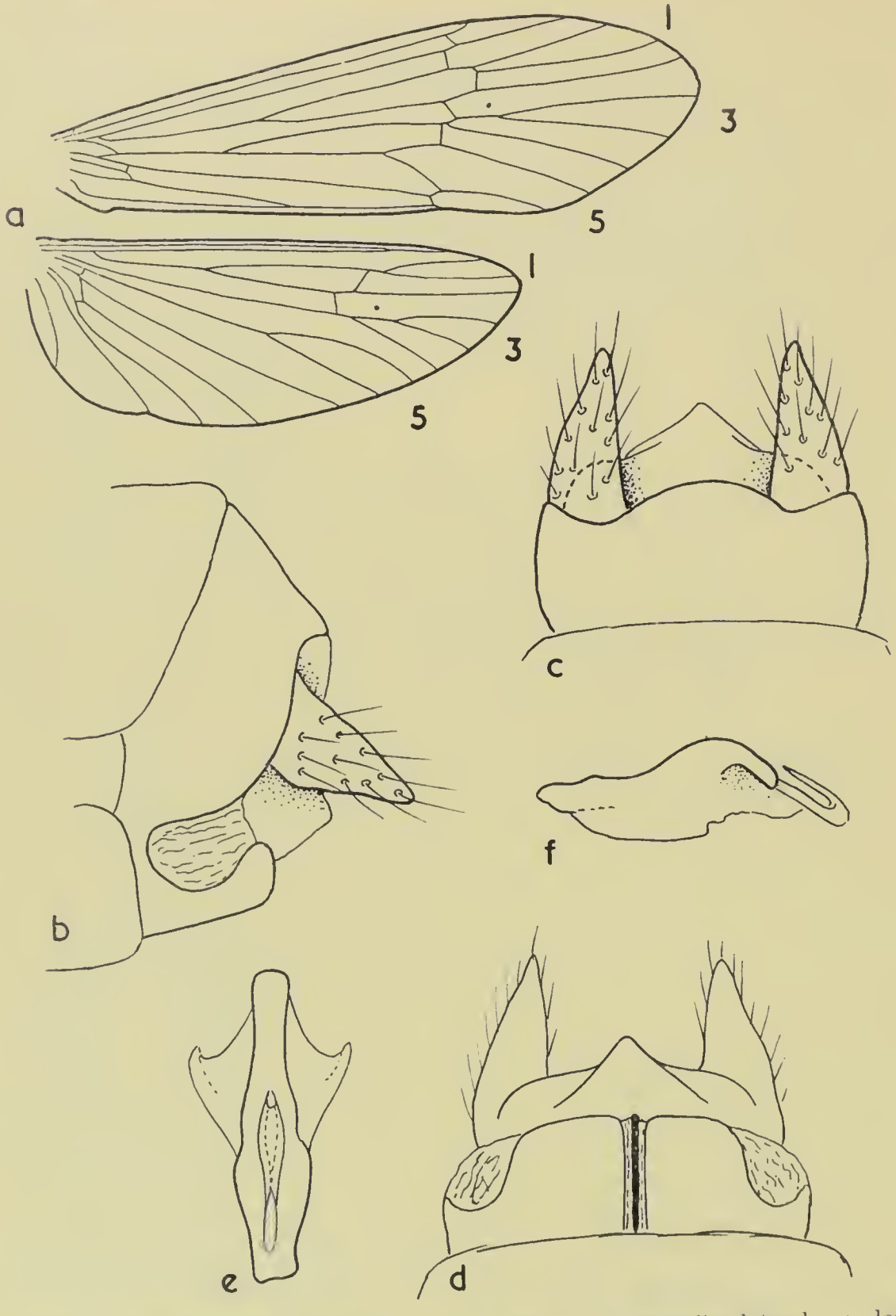

FIG. 156.—*Triplexa villa* gen. sp. n. ♀. *a*, wings; *b*, genitalia, lateral; *c*, dorsal; *d*, ventral; *e*, varginal structure, ventral; *f*, lateral.

Triplexina gen. n.

Spurs 2, 2, 4. *Maxillary palpi*, first joint short, second long but shorter than the third, fourth about as short as the first, fifth a little longer than the fourth, and flexible ; labial palpi with all three joints short and about equal in

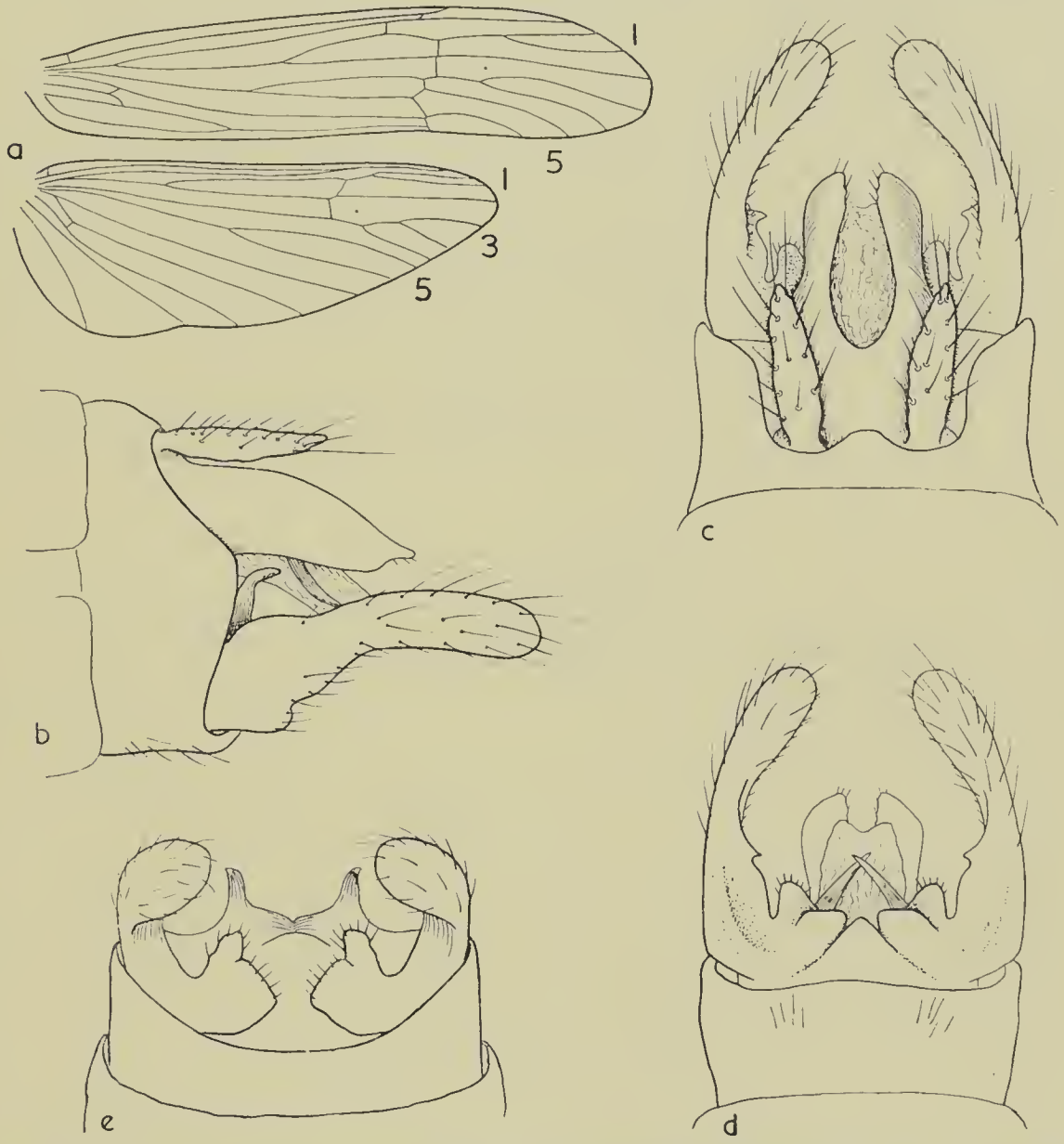

Fig. 157.—*Triplexina nigra* gen. sp. n. ♂. *a*, wings ; *b*, genitalia, lateral ; *c*, dorsal ; *d*, ventral ; *e*, inferior appendages from behind.

length. The neuration of the male anterior wing corresponds with that of *Hudsonema*, but in the female assigned to this genus the thyridial cell extends basally to the origin of the radial sector. The female anterior wing is also shorter and more rounded apically than the male. In the posterior wing

fork no. 1 is exceptionally long and narrow ; discoidal cell longer that its footstalk. The *genitalia* follow the pattern found in *Notalina*.

Type species.—*Triplexina nigra* sp. n.

The typical species is unusually small for the *Triplectidinae*, and its black colour is also unusual. Excepting for these two features and the abnormally narrow first apical fork of the posterior wing, there is little to distinguish the

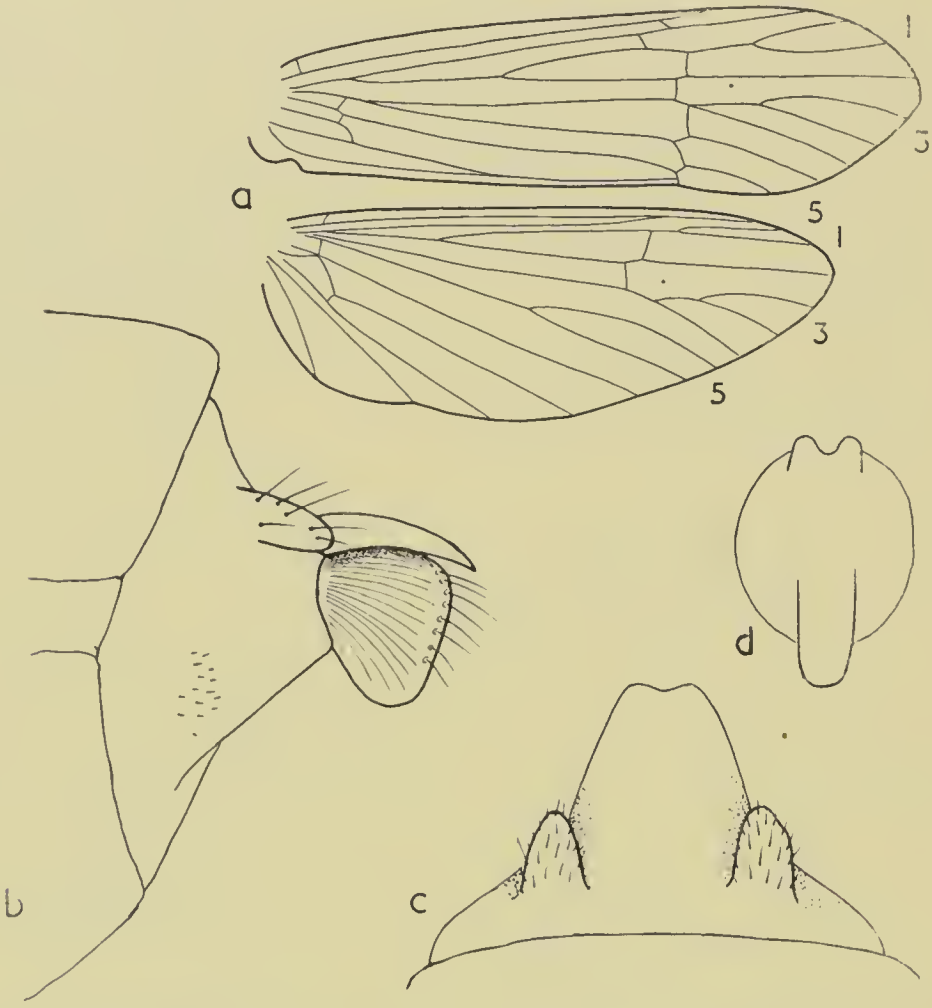

Fig. 158.—*Triplexina nigra* gen. sp. n. ♀. *a*, wings ; *b*, genitalia, lateral ; *c*, dorsal ; *d*, vaginal structure, ventral.

genus from *Hudsonema*. The genitalia, however, show a far closer affinity to those of *Notalina* species, and I therefore deem it advisable to place the single species in a distinct genus.

Triplexina nigra sp. n. (figs. 157, 158).

Insect and *wings* black. Characters other than *genitalia* given in the generic description.

Genitalia, ♂.—From above, distal margin of the ninth segment deeply and

widely excised and produced in a small " table " at the centre of the excision. Superior appendages, which are short and stout, are set one on each side of the " table " ; between and below them is the upper penis-cover which is large with a broad base, produced and bifurcate, each fork dilating slightly to the apex, which has an obliquely truncate apical margin both from above and from the side. Penis membranous with a pair of short, fine sheaths, seen from beneath, apex excised. Inferior appendages with stout, calliper-shaped arms. From beneath, the inner margins are produced inwards at the base to form two processes with flat distal margins ; between these and the main branch are small, stout, triangular processes ; the upper basal margins of the appendages are further produced in a broad plate bearing a pair of curved and distally directed hooks.

Genitalia, ♀.—From above, there is a pair of small, blunt processes beyond which the margin of the terminal segment is produced in a conical plate with excised apex ; below this, from the side, is a pair of deep, round valves or plates.

Length of the anterior wing, ♂, 7·5 mm. ; ♀, 7 mm.

Tasmania : Lake Leake, ii.1937, 1 ♂, 1 ♀, J. W. Evans.

Type, ♂, mounted as microscope preparation.

Triplectidina Mosely.

Triplectidina Mosely, 1936, *Trans. R. ent. Soc. Lond.*, 85 : 107–108.

This genus was erected to take Tillyard's *Triplectides oreolimnetes* and a Tasmanian species, *nigricornis* Mosely, where the neuration did not conform with the *Triplectides* pattern.

In Tillyard's species the inferior appendages of the genitalia conform closely with the form *Triplectides magna* Walker ; in *nigricornis* they are somewhat simpler, the inner plates very small, the second branch long and slender, and the third branch arising about midway instead of at the base.

Anterior wing with forks nos. 1 and 5 present in the male, nos. 1, 3 and 5 in the female. Discoidal cell longer than its footstalk, without a downward extension of the lower distal angle. Lower margin of the cell thickened and closely approximating to the adjacent vein, which is also thickened opposite that part ; thyridial cell absent. Discoidal cell in posterior wing varying in relation to its footstalk in the different species. Forks nos. 1, 3 and 5 present in both sexes ; *spurs* 2, 2, 4.

Type species.—*Triplectides oreolimnetes* Tillyard, 1924.

Key to Species of *Triplectidina*, Males.

1. Inferior appendage of the usual *Triplectides* pattern ; second branch short and claw-like . . . . . *T. oreolimnetes* (Tillyard) (p. 234).
–. Inferior appendage differing from the usual *Triplectides* pattern ; second branch long and slender ; third branch arising about midway instead of at the base *T. nigricornis* Mosely (p. 235).

Triplectidina oreolimnetes (Tillyard) (figs. 159, 160).

Triplectides oreolimnetes Tillyard, 1924, *Trans. N. Zeal. Inst.*, 55 : 306–307, fig. 20, pl. 19, figs. 11–12.

Triplectidina oreolimnetes Mosely, 1936, *Trans. R. ent. Soc. Lond.*, 85 : 108–109, figs. 48–51.

Head fuscous with pale grey hairs. *Antennae* fuscous with indistinct dark annulations. *Palpi* fuscous. *Anterior wing* fuscous, more or less strongly mottled with white or greyish. *Posterior wing* subhyaline.

Genitalia, ♂.—Margin of the ninth tergite widely excised, with the centre of the excision produced and rounded. Arising below the centre of the apical margin is a pair of short, triangular processes set side by side ; on each side arise the superior appendages, which are short, with rounded apices set with

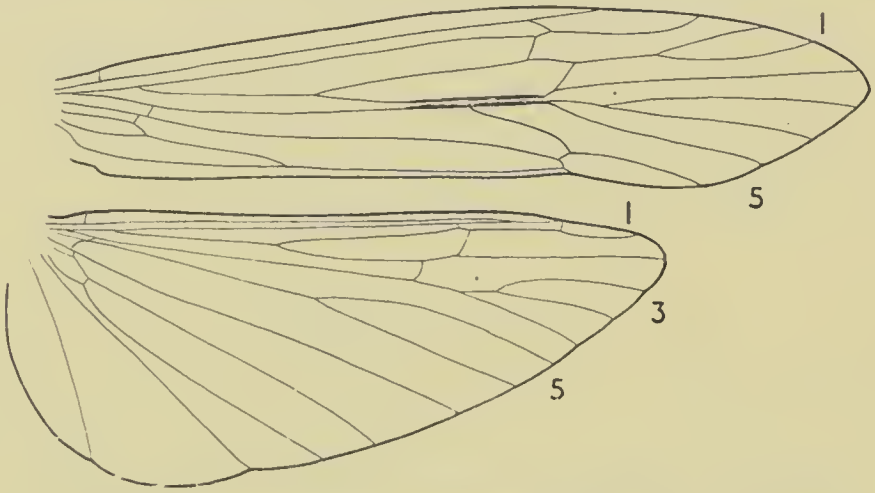

Fig. 159.—*Triplectidina oreolimnetes* (Tillyard). ♂ wings.

long, stiff hairs. Beneath them is the upper penis-cover, which is about twice the length of the superior appendages, apex cleft deeply and rather widely in two forks, with a thin, transparent plate arising beneath each. Penis about the same length as its cover, apex truncate ; lower penis-cover deeply excised. Inferior appendages three-branched, of the usual *Triplectides* pattern, the underlying second branch terminating in a chitinous claw with a strong angular projection before the apex.

Length of the anterior wing, ♂, 10 mm.

New Zealand : Gouland Downs, Nelson Province, 7.ii.1922, R. J. Tillyard, 2000 ft. (*type*) ; Mt. Arthur tableland 20.ii.1921, 4500 ft., A. Philpot.

All the above in the Cawthron Institute, Nelson, New Zealand.

New Zealand : Waimarino, i.1931, G. V. Hudson ; Okahune, N. Isl., 1922–3, T. R. Harris, in the British Museum (N.H.).

Of its habits Tillyard says :

" It appears to be confined to elevated localities in the South Island, where it is to be found sitting on the reeds or bushes fringing small mountain-tarns. The larva

has the very characteristic habit of forming its case out of small particles of micaceous matter selected from the bottom of the tarn ; the case itself is very narrow subcylindrical in shape, and can generally be detected only by the glint of the sun on the micaceous particles when the larva moves."

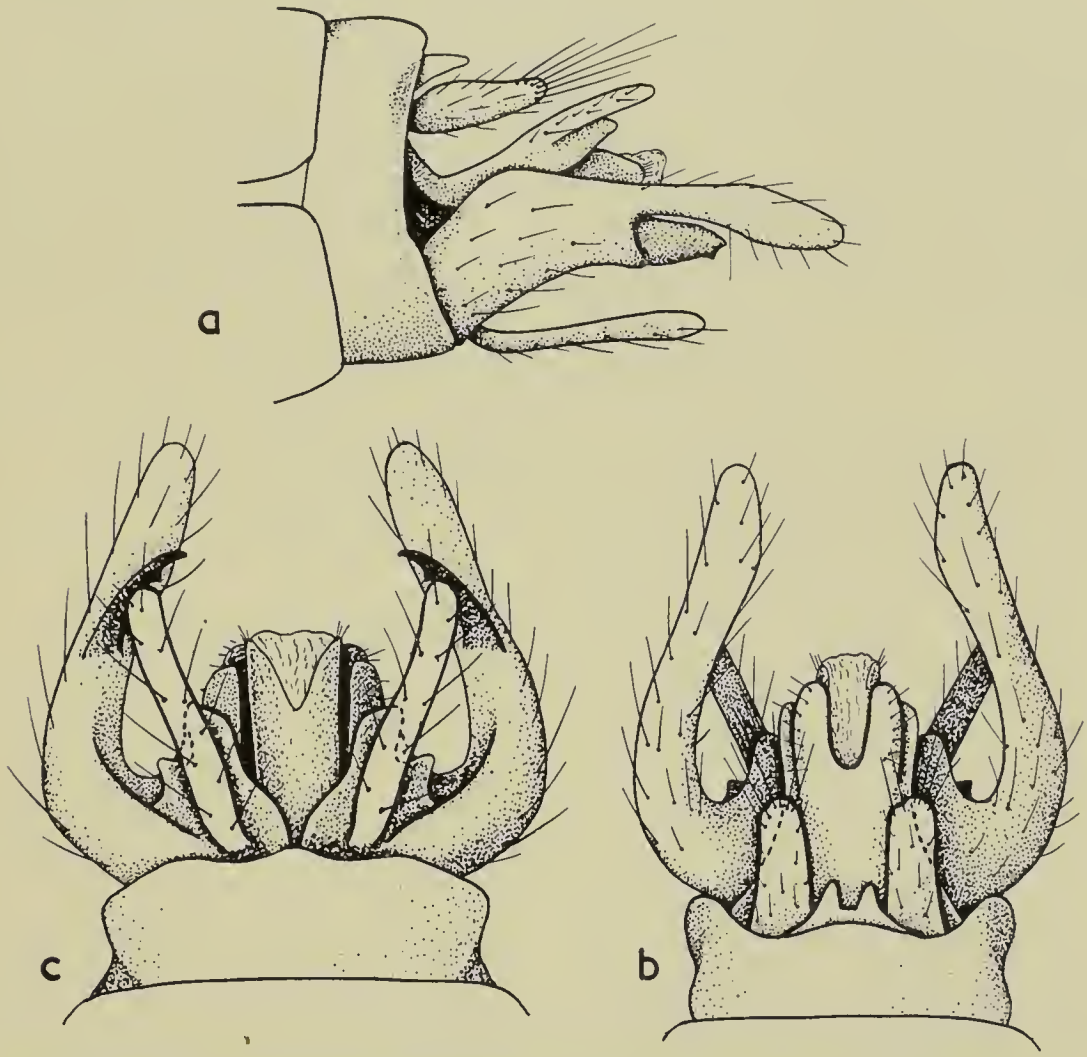

FIG. 160.—*Triplectidina oreolimnetes* (Tillyard). ♂ genitalia. *a*, lateral ; *b*, dorsal ; *c*, ventral.

Triplectidina nigricornis Mosely (figs. 161–163).

Triplectidina nigricornis Mosely, 1936, *Trans. R. ent. Soc. Lond.*, 85 : 109–110, figs. 52–55.

Head black, clothed with short, white hairs. Basal joint of the *antennae* large, reddish brown, clothed with short, white hairs ; other joints dark brown, nearly black, with white annulations. *Palpi* black with short, white hairs.

Anterior wing dark castaneous with greyish and dark fuscous pubescence, the two approximate veins beneath the discoidal cell forming a conspicuous

dark streak. *Posterior wing* dark fuscous, neuration yellowish. Legs fuscous, clothed with short, greyish hairs ; spurs of the anterior short and fuscous, median and posterior longer and white.

Genitalia, ♂.—Margin of the ninth tergite with a triangular projection at its centre. Superior appendages parallel and situated close together, one on each side of the central triangle, fringed with long hairs, short, rather broad, apices subacute. Below them is a long upper penis-cover deeply and narrowly cleft at its apex and, from the side, with a broad base, membranous towards its upper surface, more strongly chitinized in its lower part and at the cleft apex, and with a projecting angle rather beyond the middle on its lower margin. Lateral margins bearing short and rather widely-spaced hairs or spines. Penis from beneath slightly shorter than its upper cover. Inferior appendage three-branched, the upper outer branch fringed with long hairs,

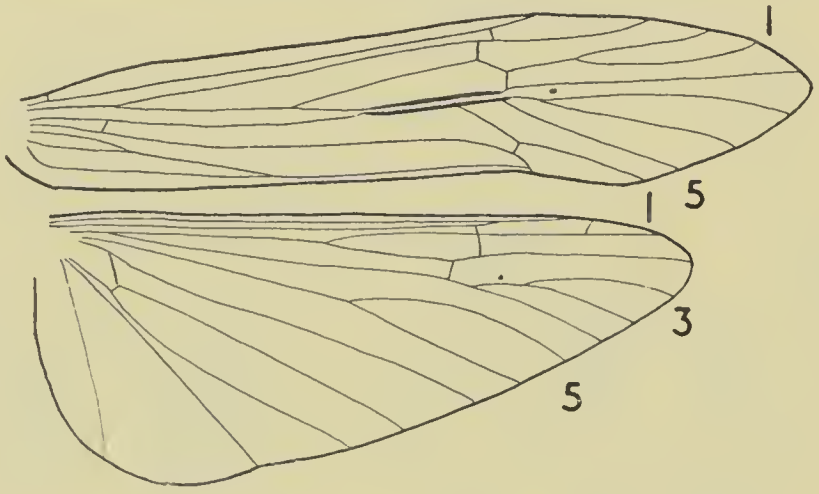

Fig. 161.—*Triplectidina nigricornis* Mosely. ♂ wings.

stout at its base, incurving, apex bearing strong, black, peg-like teeth on its inner surface. Arising on the inner surface towards the base is a slender branch, calliper-shaped as seen from above. The third branch only visible from the side and from beneath : it arises towards the base of the appendage, and is seen from the side to be shorter and narrower than the upper branch, lying approximately parallel with it.

Genitalia, ♀.—From above, distal margin of the terminal segment produced slightly at its centre ; beneath this is a pair of stout, thimble-shaped processes, between which is a transparent plate bisected by a pigmented line ; beneath this is a pair of elongate, subquadrate plates. Eighth sternite darkly pigmented, with the distal margin closely fringed.

Length of the anterior wing, ♂, 12 mm. ; ♀, 12·5 mm.

Tasmania : Miena, 3300 ft., xii. 1929 (H. M. Stephen).

Type, ♂, and paratypes in the British Museum (N.H.), from the Mosely Collection.

Hudsonema Mosely.

Tetracentron F. Müller ,1881, *Z. wiss. Zool.*, **35** : 77.
Leptocerus (?) Hutton, 1899, *Trans. N. Zeal. Inst.*, **31** : 242.
Pseudonema Hudson, 1904, *N. Zeal. Neur.* : 72 (*partim*).
Triplectides Ulmer, 1907, *Gen. Insect.*, **60a** : 131 (*partim*).
Hudsonema Mosely, 1936, *Trans. R. ent. Soc. Lond.*, **85** : 110.

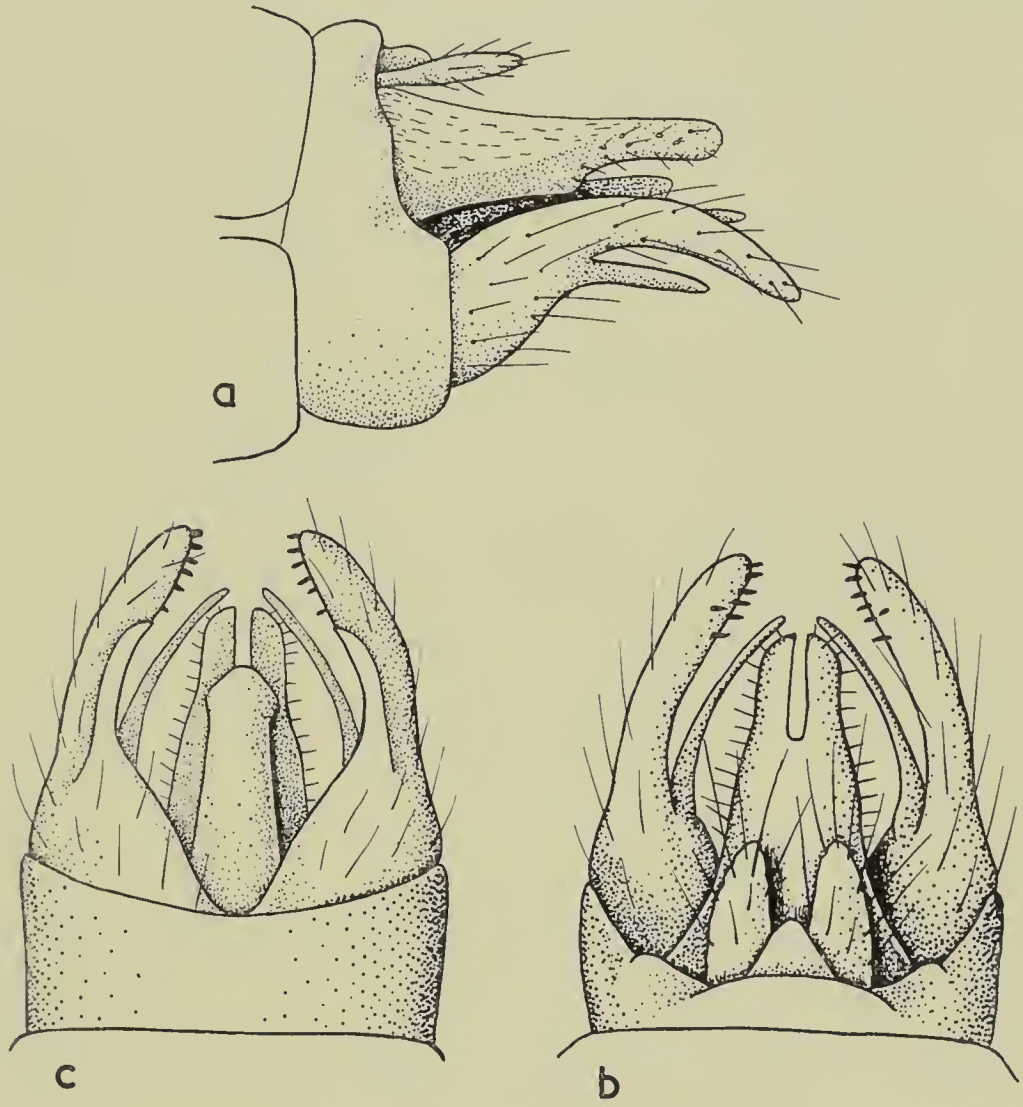

Fig. 162.—*Triplectidina nigricornis* Mosely. ♂ genitalia. *a*, lateral ; *b*, dorsal ; *c*, ventral.

Maxillary palpi, first and second joints nearly equal in length ; second longer than the third ; third longer than the first or fourth ; fifth about as long as the third (these proportions are inclined to vary in individuals and in the ♀). *Anterior wing* long and narrow ; in the ♂ forks nos. 1 and 5 present ;

in the ♀ 1, 3 and 5. Discoidal cell long and narrow, normal in shape. Posterior wing broad at the base, elongate towards the apex; forks nos. 1, 3 and 5 present in both sexes. Discoidal cell long and narrow. *Spurs* 2, 2, 4.

Type species.—*Tetracentron amabile* McLachlan, 1868.

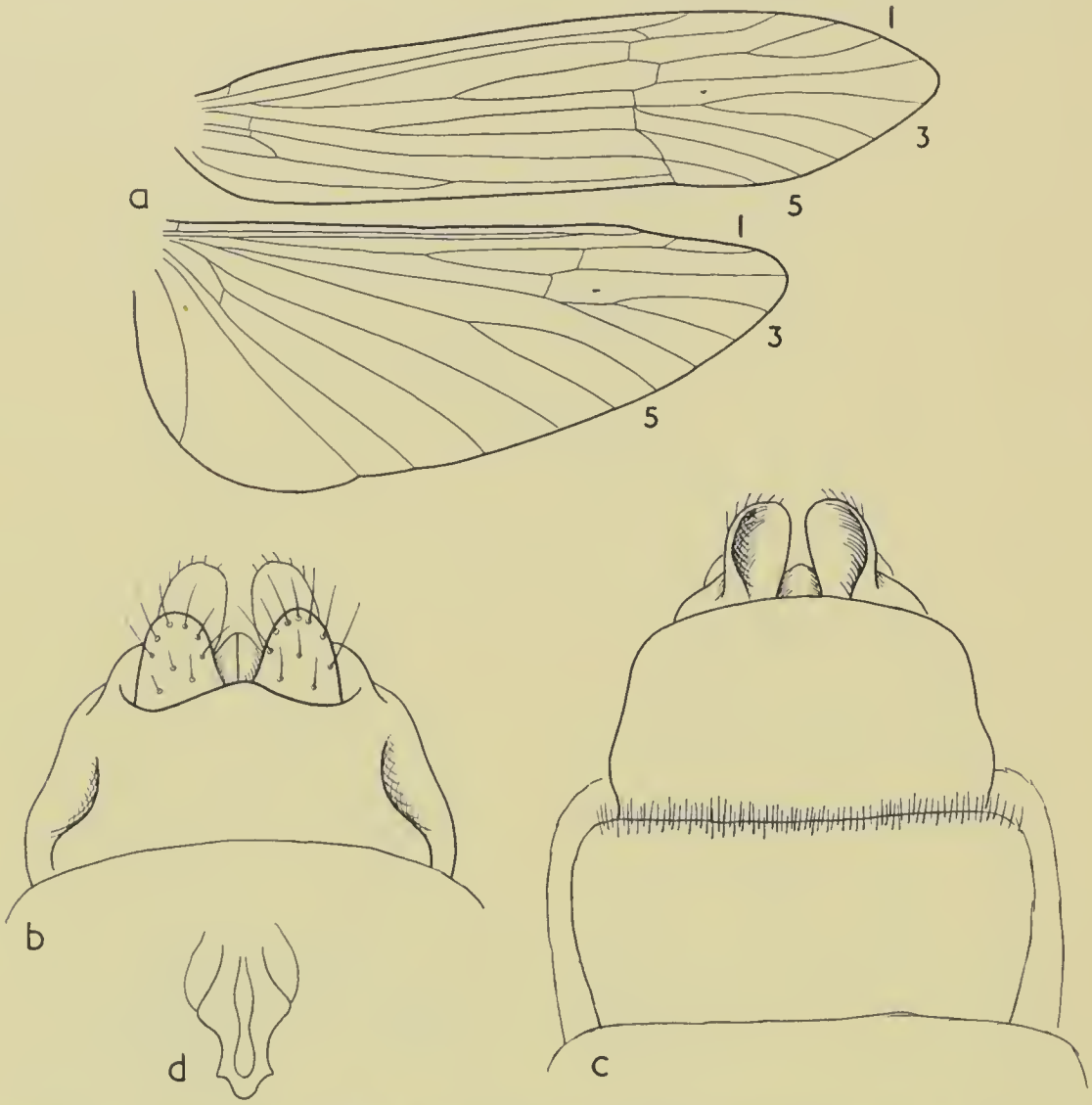

Fig. 163.—*Triplectidina nigricornis* Mosely. ♀. *a*, wings; *b*, genitalia, dorsal; *c*, ventral; *d*, vaginal structure, ventral.

Key to Species of *Hudsonema*.

1. Thyridial cell about twice as long as discoidal cell; inferior appendages unbranched . . . . . 2.
–. Thyridial cell only slightly longer than discoidal cell; inferior appendages three-branched . . . . . 3.
2. Wings of male almost unicolorous brown, apex of anterior wing of female rounded . . . . . *H. aliena* (McLachlan) (p. 239).
–. Wings of male variegated with brown and grey, apex of anterior wing of female pointed . . . . . *H. amabilis* (McLachlan) (p. 241).

3. Thyridial cell longer than discoidal cell ; apices of upper penis-cover produced at inner angles . . . . . *H. maculata* sp. n. (p. 245).
–. Thyridial cell as long as discoidal cell ; apices of upper penis-cover not produced at inner angles . . . . . *H. sparsa* sp. n. (p. 246).

Hudsonema aliena (McLachlan) (figs. 164, 165.)

Leptocerus (?) *alienus* McLachlan, 1868, *Journ. Linn. Soc. Lond. Zool.*, **10** : 202–203.
Leptocerus (?) *alienus* McLachlan, 1873, *Ann. Mag. N. H.*, (4) **12** : 41.
Leptocerus (?) *alienus* Hutton, 1899, *Trans. N. Zeal. Inst.*, **31** : 242.
Leptocerus (?) *alienus* Hudson, 1904, *N. Zealand Neur.* : 77–78.
Notanatolica aliena Ulmer, 1907, *Gen. Insect.*, **60a** : 131.
Triplectides (?) *aliena* Mosely, 1936, *Trans. R. ent. Soc. Lond.*, **85** : 125.

McLachlan describes the species as follows :

" *Head—antennae* whitish cinereous, each joint after the two basal ones black in its upper portion ; towards the apex they are almost entirely black, the basal portion

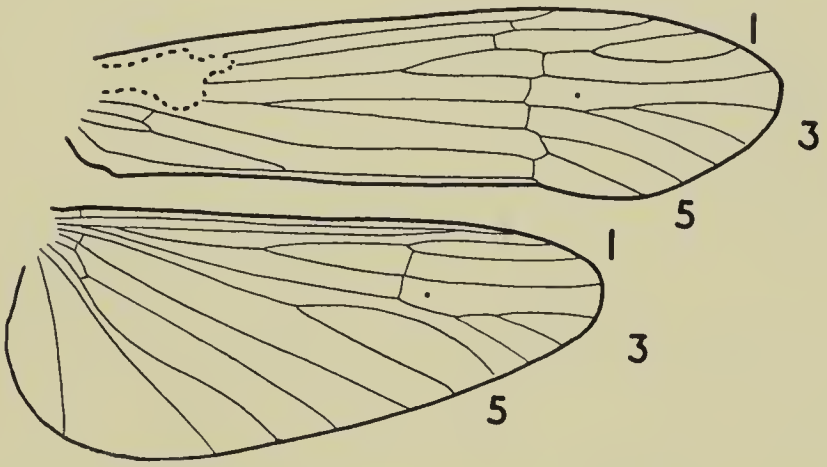

Fig. 164.—*Hudsonema aliena* (McLachlan). ♀ type wings.

of each joint retaining a narrow cinereous ring : *vertex* and *face* thickly clothed with long cinereous hairs : *maxillary palpi* fuscous, clothed with cinereous hairs ; first joint short, second and third very long and equal, fourth short, fifth longer than the fourth."

" *Thorax—mesothorax* longly ovate, dull black, a depressed space in the centre filled with cinereous hairs ; *metathorax* small, blackish fuscous, hairless."

" *Wings—anterior wings* long and narrow, scarcely dilated towards the apex, densely clothed with pale cinereous hairs, and with blackish dots placed pretty regularly on the veins ; two elongate blackish spots on the dorsal margin, a large apical bloteh obscurely blackish ; fringes cinereous and blackish ; neuration similar to that of the European species (♀) [*Athripsodes*] : *posterior wings* smoky grey, rather densely hairy ; neuration fuscous ; the discoidal cell is closed ; the upper branch of the ramus discoidalis forked at the end, the lower simple ; the ramus subdiscoidalis is twice forked at the end, as is the ramus thyrifer of the anterior wings (♀) of European species [*Athripsodes*]."

" *Legs* pale yellowish cinereous, with fuscous coxae."

"*Abdomen* brownish, the last segments beneath form an impressed, shining, flattened space ; above are two small obtuse, hairy, yellow appendices (♀)."

" Long. corp. $3\frac{1}{2}'''$; exp. alar. $11'''$."

" Christchurch, Canterbury (*Fereday*) ; 1 ♀ in very good condition."

Type, ♀, in the British Museum (N.H.).

The wings of the type, which have not previously been figured, were removed from the specimen, cleaned, denuded, and are now mounted between

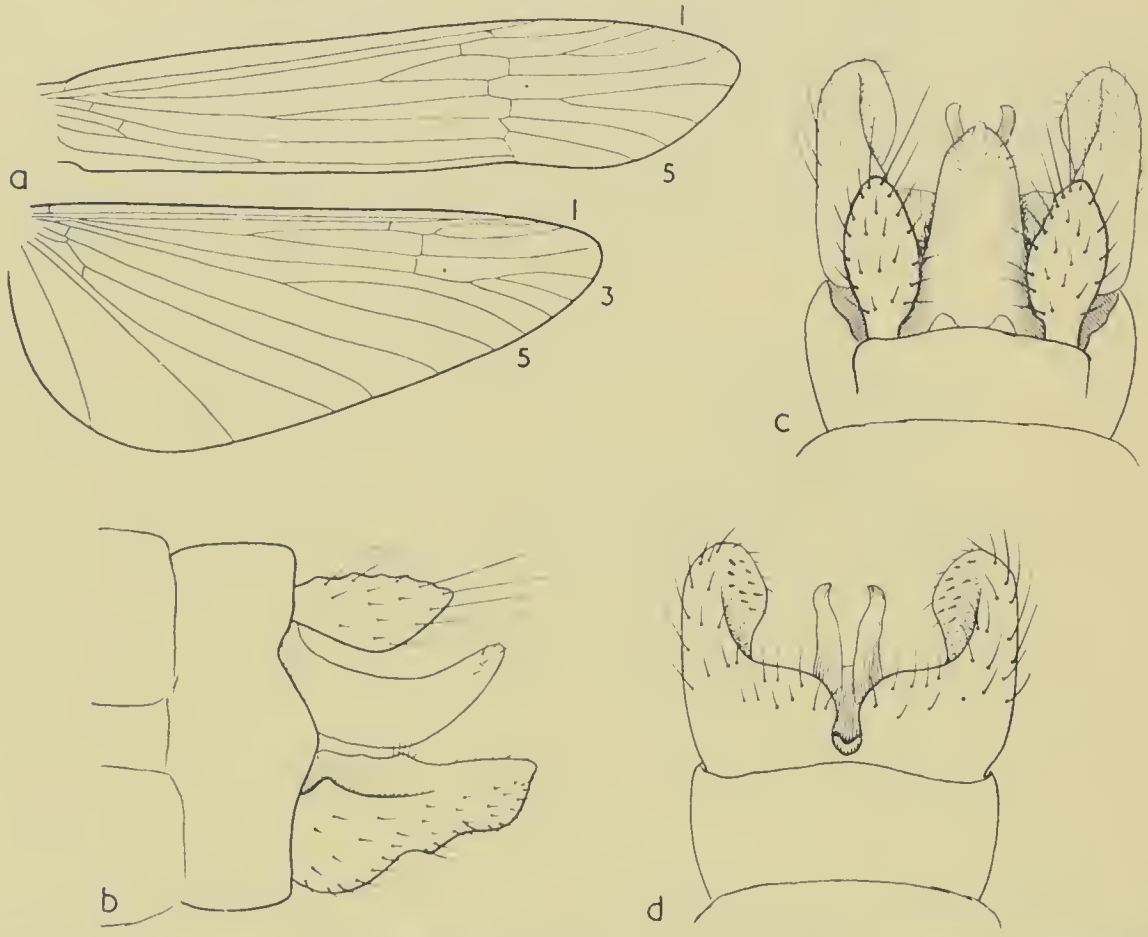

Fig. 165.—*Hudsonema aliena* (McLachlan) ? ♂. *a*, wings ; *b*, genitalia, lateral ; *c*, dorsal ; *d*, ventral.

sheets of celluloid. It is evident, from the shape of the discoidal cell of the anterior wing and the presence of fork no. 1 in the posterior, that it belongs to *Hudsonema* rather than to *Triplectides*.

The rounded apical margin of the anterior wing separates it from *Hudsonema amabile*, though the possibility that it may be aberrant must not be dismissed.

[Two males, presented to Tillyard by Mr. G. V. Hudson, differ in a number of points from *H. amabile*, and are here described provisionally as the male of *H. aliena* (McLachlan).

♂. *Head* dark brown, with fulvous and brown hairs. *Antennae* dark

brown, with whitish annulations at the joints. *Palpi* dark brown, with scattered pale hairs. *Thorax* and *abdomen* dark brown. Anterior *legs* dark brown, median and posterior femora brown, tibiae and tarsi fulvous. *Anterior wing* fuscous, densely clothed with fulvous pubescence ; a little paler in the neighbourhood of the pterostigma. Marginal fringe fuscous along anterior border, pale yellowish behind the apex. Posterior wing fairly densely clothed with reddish fuscous pubescence. Two spots of pale yellowish hairs near the margin behind the apex, one in fork no. 3, the other (the larger) on the upper margin of fork no. 5. The anterior wing is a little broader than in *amabile* ; apex less pointed, fork no. 1 and the fourth apical cell with shorter footstalks. The *posterior wing* is narrower than in *amabile*, the anal fan being less developed. Fork no. 3 is longer and narrower.

Genitalia, ♂.—Dorsal margin of the ninth segment not excised, with two small membranous fingers arising from it towards its centre. Superior appendages leaf-shaped from above and from the side ; beneath them is seen the upper penis-cover, a tapering hood from above, and parallel-sided to about midway in lateral aspect, then curving upwards and tapering to a rounded apex. Penis cylindrical, slightly arched, and with a deeply bifurcate apex, each fork slightly incurved at apex. No lower penis-cover. Inferior appendages unbranched, broad at their bases, from the side tapering to an obliquely truncate apex. From beneath, the inner basal margins are rounded, apices dilated on their inner surfaces and set with a few short spines. The upper basal margins are fused together, forming a transverse shelf below the penis, excised at its centre.

Length of anterior wing, 13 mm.

New Zealand : G. V. Hudson (82*c*, *d*), from the Tillyard Collection, 2 ♂.

These examples were labelled *N. aliena* by Tillyard, and I think that there is some justification for assuming them to be the males of McLachlan's *aliena*. In both male and female the posterior wing is narrower at the base than in *amabile*, and the footstalk of fork no. 1 in the anterior wing is shorter.

In general appearance these two males are strikingly different from *amabile*, the wings being almost unicolorous brownish, apart from the few apical pale yellowish patches noted in the description above. The specimens are not denuded, and show no traces of the hoary pubescence which gives the variegated appearance to *amabile*. The hairs on the head are yellowish, not hoary. —D.E.K.].

Hudsonema amabilis (McLachlan) (figs. 166, 167).

Tetracentron amabile McLachlan, 1868, *Journ. Linn. Soc. Lond. Zool.*, **10** : 201–202, pl. 2, fig. 5.
Tetracentron amabile McLachlan, 1873, *Ann. Mag. N. H.*, (4) **12** : 40.
Pseudonema amabilis Hutton, 1899, *Trans. N. Zeal. Inst.*, **31** : 241.
Pseudonema amabilis Hudson, 1904, *N. Zealand Neur.*75–76, pl. 10, figs. 8, 9.
Triplectides amabilis Ulmer, 1905, *Ann. Nat. Hist. Hofmus. Wien*, **20** : 72.
Triplectides amabilis Ulmer, 1907, *Gen. Insect.*, **60a**: 131.
Triplectides amabilis Tillyard, 1926, *Ins. Aust. N. Zeal.* 392, pl. 26, fig. 11.
Hudsonema amabilis Mosely, 1936, *Trans. R. ent. Soc. Lond.*, **85** : 111, figs. 56–62.

McLachlan describes the species as follows :

" *Head—antennae* very slender, longer in the ♂ than in the ♀, fuscous, the base of each joint beyond the basal with a narrow whitish ring ; basal joint wholly fuscous, with grey hairs ; *vertex* fuscous, clothed with grey hairs ; *face* very densely clothed with grey hairs ; *palpi* fuscous, with grey hairs : the maxillary very long, first and fourth joints nearly equal in length, second very long, third longer than

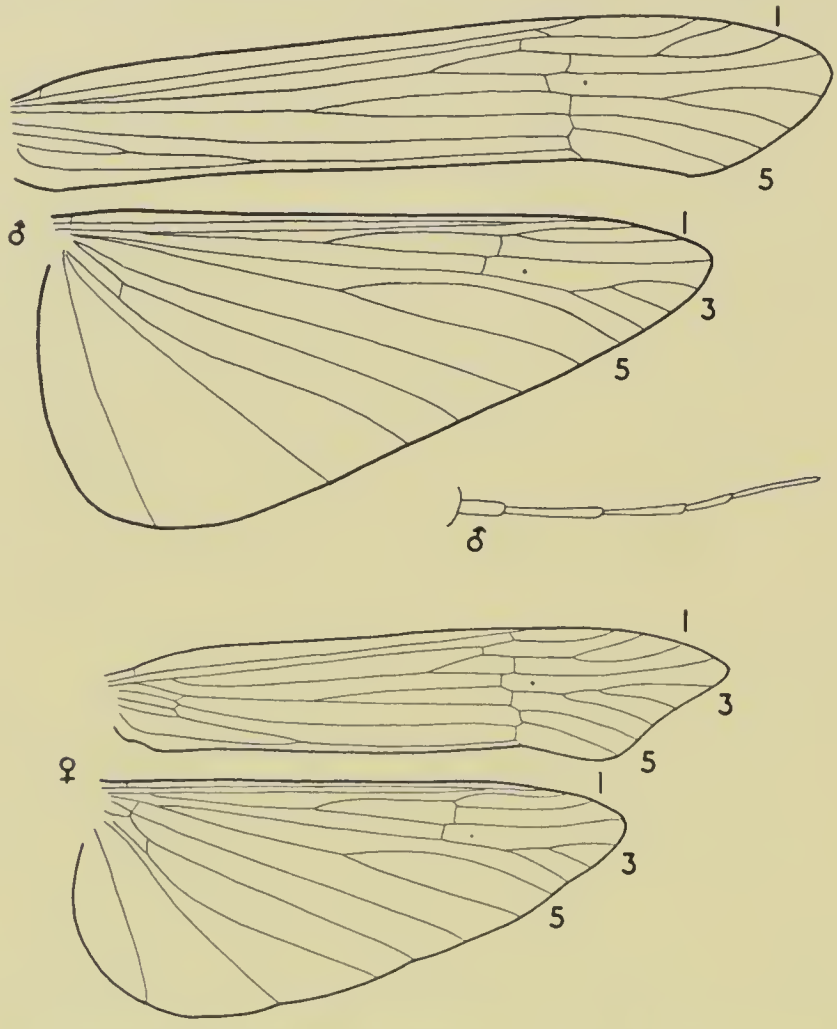

Fig. 166.—*Hudsonema amabilis* (McLachlan). ♂♀ wing, maxillary palp.

the first or fourth, but much shorter than the second, fifth very slender, and about as long as the third ; *eyes* fuscous, slightly brassy."

" *Thorax* pale fuscous ; *mesothorax* very long, a broad depressed channel in the centre, on each side of which is a raised longitudinal line, posteriorly with a large round raised lobe, flattened on the top, scutellum triangular, almost hairless, there being only a few long greyish hairs on each side of the central depression, and shorter ones on the flattened surface of the posterior lobe ; *metathorax* slightly paler than the mesothorax, small, hairless ; the anterior margin deeply notched, the metascutellum triangular ; the breast is rather densely clothed with grey hairs."

" *Wings—anterior wings* very long and narrow, the apical margin oblique,

whitish cinereous, with numerous fuscous irrorations ; the region of the anastomosis, an oblique spot on the costa slightly before the apex, and the apical margin also fuscous, the latter interrupted by a conspicuous white spot above the anal angle,

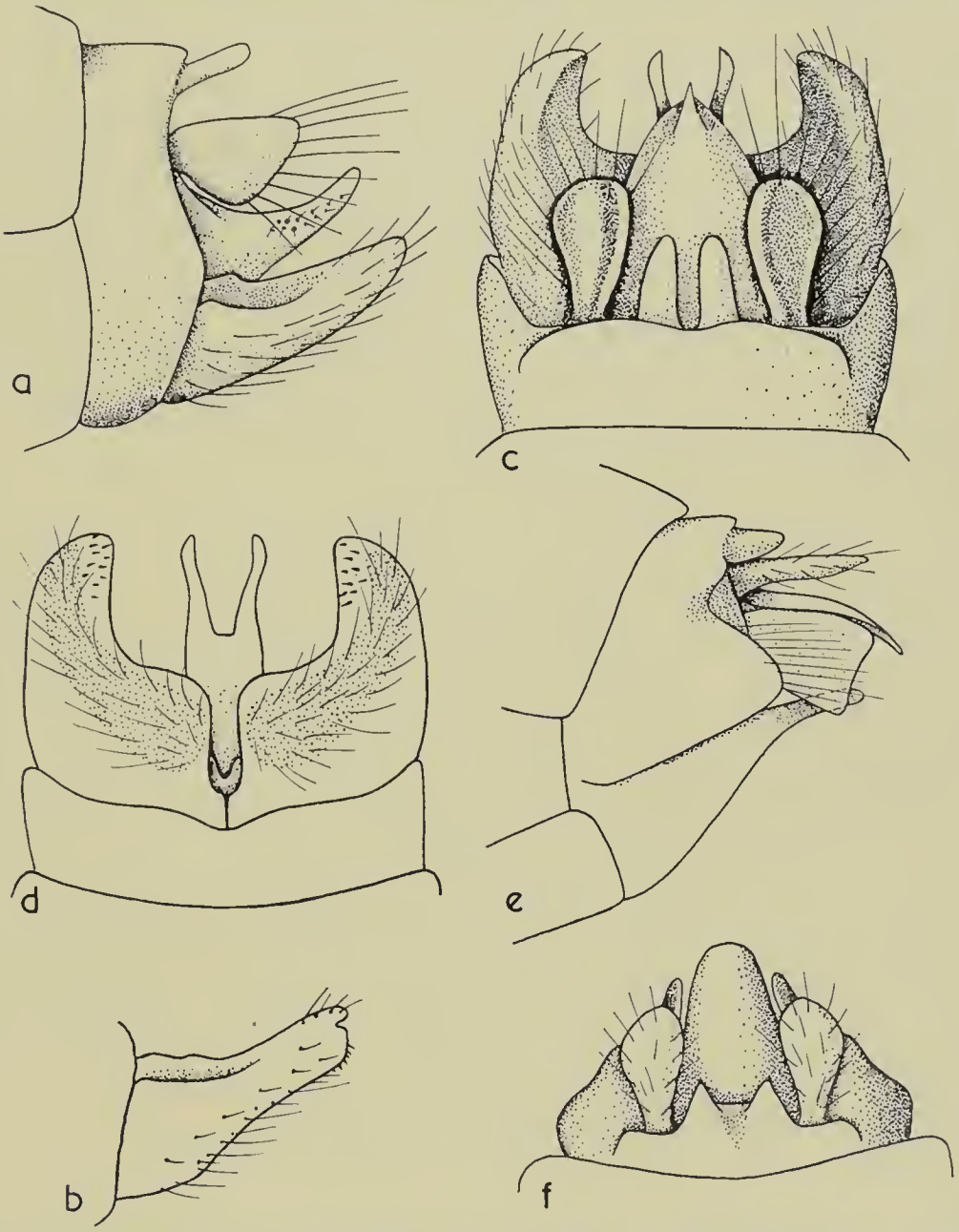

Fig. 167.—*Hudsonema amabilis* (McLachlan). ♂♀. *a*, ♂ genitalia, lateral ; *b*, inferior appendage, lateral, from another example ; *c*, genitalia, dorsal ; *d*, ventral ; *e*, ♀ genitalia, lateral ; *f*, dorsal.

which colour there invades the fringe, which is otherwise fuscous ; a pale yellowish-white longitudinal streak on the middle of the disk, ending at the anastomosis : these markings, as well as the cinereous ground-colour, are all produced by the arrangement of the variously-coloured short hairy clothing ; the discoidal

cell is long and closed, the cellula thyridii very long and also closed (a probable transverse veinlet between the lower branch of the ramus discoidalis and the ramus thyrifer is indicated in the figure by a dotted line, as I am unable to clearly make it out) ; ramus thyrifer simply furcate in the ♂, twice forked in the ♀ (as in *Leptocerus* [= *Athripsodes* Blbg.—D. E. K.]) : *posterior wings* subhyaline, rather thickly clothed with short yellowish pubescence, especially towards the apex ; fringes short, yellowish ; neuration darker."

" *Legs* whitish cinereous ; the anterior tibiae and all the tarsi fuscescent ; all the coxae dark fuscous ; the underside of the tarsi with numerous short spines ; spurs fuscescent, rather short, but the inner one the longer in all the pairs."

"*Abdomen* fuscous. In the ♂ the terminal dorsal segment has a circular notch in the middle of its margin ; app. sup. forming two short and broad, somewhat triangular plates, furnished with long hairs on the margins and at the tip ; app. inf. stout, scarcely pointed, directed upwards, brown ; between them is the penis, which is short and thickened, with an appearance of a spine-like tooth at its apex. In the ♀ are two superior valves, resembling the app. sup. of the ♂ ; these are placed one on each side of a short oviduct ; beneath, the last segment is slightly concave and shining."

" Long. corp. 4–5‴ : exp. alar. 12–13‴."

" Christchurch, Canterbury (*Fereday*). 2 ♂, 3 ♀."

I give a further description of the ♂ genitalia made from a specimen cleared in KOH.

Genitalia, ♂.—Dorsal margin of the ninth tergite shallowly excised at its centre with two short, semi-transparent processes arising one on each side of the excision, directed towards the tail ; superior appendages from the side broadly triangular ; beneath them is the upper penis-cover, broad at the base, narrowing to an acute apex directed slightly upwards. Penis broad at the base, bifurcate from about its centre, each fork rather acute. No lower penis-cover. Inferior appendages unbranched, broad at the base both from the side and beneath. From the side, strongly ridged along its length towards the base. In some examples the apex of the appendage is more or less acute ; in others it is truncate, the upper angle projecting as a short finger, with a small excision beneath it. From beneath, strongly angulated midway along the inner margins, with strongly pigmented areas, carrying long hairs, stretching from the outer margins of the apices to the inner margins of the bases. Ventral margin of the ninth sternite slightly excised. The forks of the penis in dried examples are sometimes pressed closely together to give the appearance of a single spine as mentioned in McLachlan's description.

The following is a description of the ♀ genitalia, also from an example cleared in KOH.

Genitalia, ♀.—Dorsal margin of the ninth tergite produced at its centre with two short, triangular processes, one on each angle of the produced portion ; outside and below these processes, from above, are two broadish processes with narrow bases, narrow as seen from the side ; beneath them is the tubular piece composed of four plates, dorsal slightly longer than the others and overhanging the orifice ; from the side, the lateral plates are broad with broad, slightly concave apical margins.

Length of anterior wing, ♂ and ♀, 14 mm.

Type, ♂, in the British Museum (N.H.).

The perfect insect is on the wing from the middle of November to the end of Deeember.

Hudson writes of the biology as follows :

" The larva of this insect inhabits clear, running streams. It constructs a strong, cylindrical, slightly tapering case made entirely of small stones, thus differing in a remarkable manner from the case of the preceding insect [*Triplectides obsoleta.*—D. E. K.], which is exclusively composed of vegetable detritus. The length of this case, when the larva is mature, is about an inch. In structure the larva itself appears to closely resemble that of *P. obsoleta*, but it is of course much smaller. It is very active in its habits, and may often be seen travelling with great rapidity across sandy patches in the river bed. It frequents the edges of rivers and streams, where the current is less rapid. Here there is usually a fair deposit of sandy or fine shingly material, which it certainly prefers to a river-bed entirely composed of rocks or large boulders. In these situations the larvae are often very common, especially during the first fortnight in November, when they are full grown and the cases fairly conspicuous, owing to their comparatively large size."

" When mature this insect closes both the orifices of its case by fastening a small stone to each end. Hence the case rests loosely on the river-bed, and is not attached to a firm object. The enclosed pupa closely resembles that of *P. obsoleta*, but is of course considerably smaller. Its extremely long and delicate antennae are very remarkable. The emergence of the imago occurs in the usual manner, and the pupa skin, with its exquisitely delicate antennal coverings, may be seen floating on the water after the escape of the caddis-fly."

" The perfect insect appears about the middle of November, and is very abundant until the end of December. It flies in swarms at evening dusk, and may be at once recognised by its extremely rapid zigzag flight. When seen projected on the bright sky of sunset, its long fine antennae are clearly visible, being held out straight in front of the insect, whilst it is on the wing. I noticed great numbers of these insects flying in this way around the margins of Lake Pukaki, and I expect that it will be found to frequent many other treeless situations of similar character. The larva of *P. amabilis* apparently takes the place of that of *P. obsoleta* in streams, where there is no forest detritus, and I consider that the differences of habit between these two insects, as regards the material and construction of their respective cases, is of unusual interest."

Hudsonema maculata sp. n. (fig. 168).

Wings castaneous, narrow ; anterior mottled with minute clusters of short, white hairs. *Head* dark fuscous. *Antennae* with a yellowish, rounded wart at the base of the inner side of the basal joint ; remaining joints chocolate with narrow white annulations. In the *anterior wing* thyridial eell is a little longer than the discoidal cell ; *posterior wing*, fork no. 5 rather short, posterior margin somewhat excised at the third anal vein.

Genitalia, ♂.—From above, distal margin of the ninth segment straight. Superior appendages short and stout ; beneath them is a large upper penis-eover, cleft at the apex, with a strongly concave upper margin as seen from the side. Penis short and membranous. Inferior appendages of the *Triplectides* pattern rather than that of *amabilis*, three-branched ; upper braneh

the longest ; second branch curved and spiniform. Basal branches very short, widely divergent from beneath ; inner plates with apices terminating in outturned beaks.

Length of anterior wing, ♂, 14·5 mm.

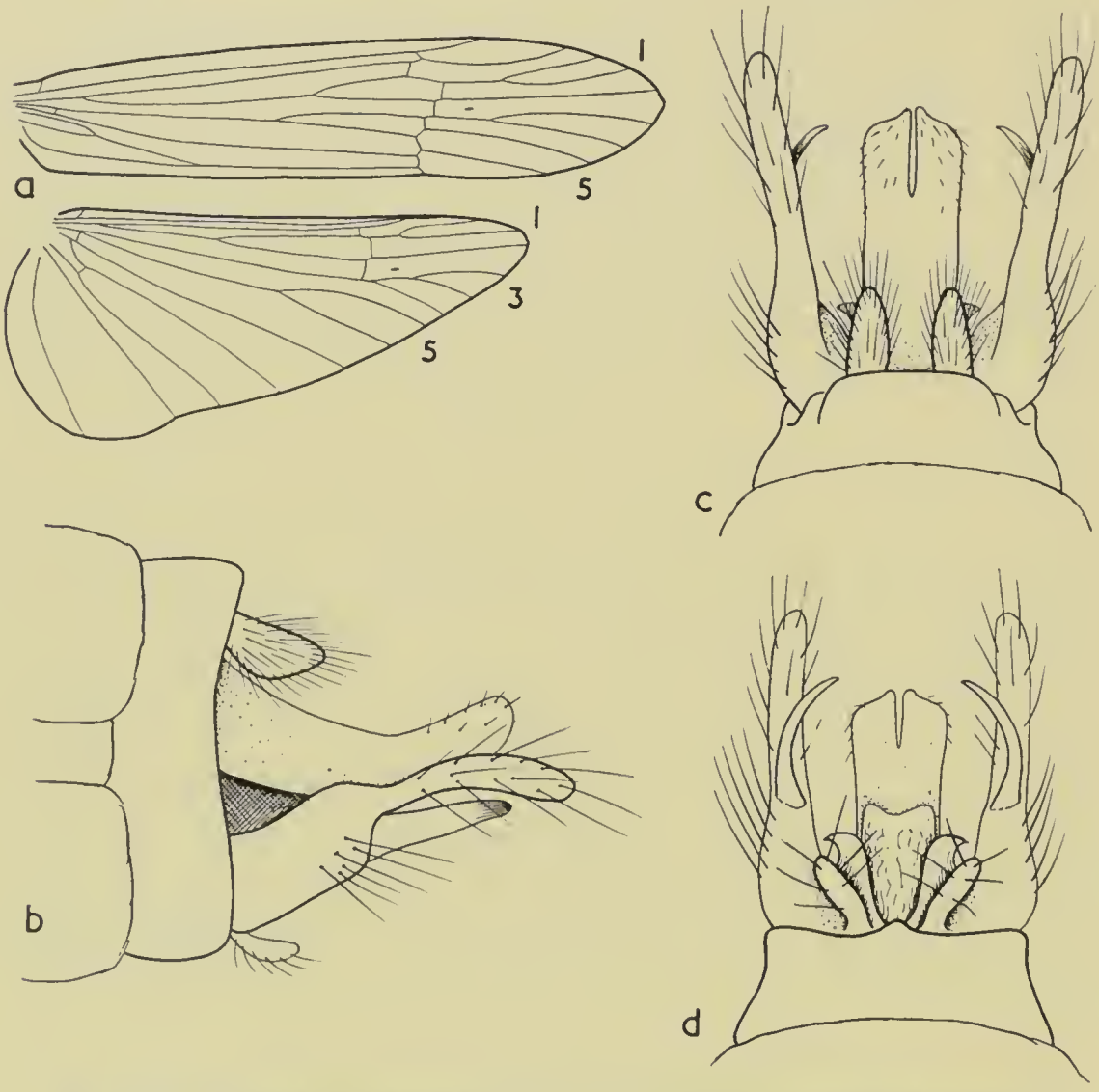

Fig. 168.—*Hudsonema maculata* sp. n. ♂. *a*, wings ; *b*, genitalia, lateral ; *c*, dorsal ; *d*, ventral.

Australia : New South Wales, Blue Mts., Leura, 3000 ft., 6.x.1914, 1 ♂ (*type*) ; Sydney, 18.ix.1884, 1 ♂, McLachlan Collection.

In this species the neuration is typically that of *Hudsonema*, whilst the genitalia is equally typical of *Triplectides*.

Hudsonema sparsa sp. n. (Kimmins) (fig. 169).

♂. *Head* fuscous, with white and fuscous hairs. *Antennae* pale fuscous, not annulated, basal joint with white and fuscous hairs. *Palpi* dark brown,

with brown hairs. *Thorax* fuscous, with scattered whitish hairs and brown setae. *Abdomen* fuscous. *Legs* fuscous, with whitish and yellowish pubescence. *Anterior wing* pale fuscous ; pubescence fulvous, with a sprinkling of whitish

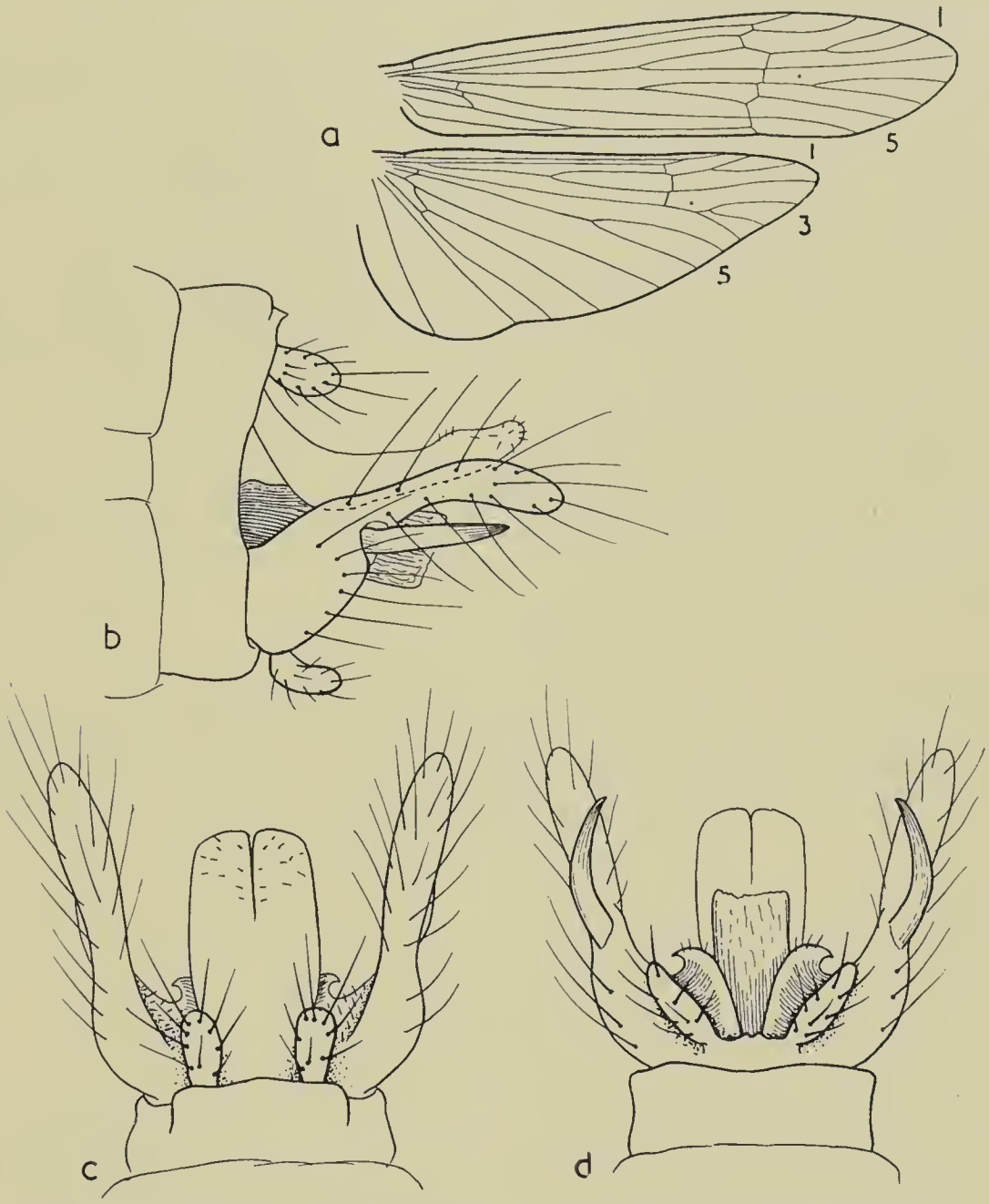

FIG. 169.—*Hudsonema sparsa* sp. n. ♂. *a*, wings ; *b*, genitalia, lateral ; *c*, dorsal ; *d*, ventral.

hairs, but not forming spots. *Posterior wing* very pale fuscous, with scanty yellowish pubescence. In anterior wing fork no. 1 is a little longer than its footstalk, discoidal and thyridial cells of about equal length. Posterior

wing rather narrower at base than in *maculata*. Fork no. 1 barely twice the length of its footstalk ; fork of the media well beyond the anastomosis, making the footstalk of fork no. 3 very short.

Genitalia, ♂.—Dorsal margin of ninth segment truncate. Superior appendages short : beneath them is seen the upper penis-cover, forming a long hood, from above more or less parallel-sided ; apex shallowly rounded, and with a median slit extending not quite half-way. From the side the upper penis-cover is slender and slightly upcurved. Penis cylindrical, membranous, with more chitinized lateral margins, apex truncate. Inferior appendages of the *Triplectides* pattern, with three branches. The main branch is about half as long again as the base, finger-like, moderately dilated. The second branch is slender, claw-like, arising from below the base of the main branch. Third branch arises at the base of the appendage on the lower surface, and is short stout and cylindrical, directed downwards and outwards. Inner plates fused at their bases, forming hooked plates arising from the inner upper margin at the bases of the appendages.

Length of anterior wing, 10 mm.

Tasmania : Cradle Mts., 18.i.1179, 7 ♂, R. J. Tillyard.

This species is related to *H. maculata* Mosely, but may be separated by its smaller size, unspeckled anterior wing and shorter thyridial cell. The apex of the upper penis-cover is smoothly arched or truncate, not produced at the inner apical angles.

Notalina Mosely.

Notalina Mosely, 1936, *Trans. R. ent. Soc. Lond.*, 85 : 114.

The genus *Notalina* differs from *Hudsonema* (p. 237) in the absence of fork no. 1 and in the rather long discoidal cell in the posterior wing. *Spurs* 2, 2, 4.

Type species.—*Notalina parkeri* Mosely, 1936.

Key to Species of *Notalina*, Males.

1. General colour fuscous . . . . . *N. parkeri* Mosely (p. 249).
–. General colour ochraceous or fulvous . . . . . 2.
2. Anterior wing yellowish, with numerous small brownish irrorations *N. moselyi* sp. n. (p. 251).
–. Anterior wing without numerous small brownish irrorations . . . . 3.
3. Inferior appendage with a hairy inner branch ; apices of upper penis-cover rounded . . . . . 4.
–. Inferior appendage without hairy inner branch ; apices of upper penis-cover acute . . . . . *N. flava* (Ulmer) (p. 253).
4. Apical excision of upper penis-cover only slightly deeper than broad ; apex of cover from side acute . . . . . *N. delicatula* (Ulmer) (p. 255).
–. Apical excision of upper penis-cover twice as deep as broad ; apex of cover from side truncate . . . . . 5.
5. Inferior appendage from side with a definite hook on lower surface ; anterior wing with a conspicuous fuscous spot on margin at arculus *N. fulva* sp.n. (p. 257).
–. Inferior appendage from side with only a minute hook on lower surface ; anterior wing with the marginal fringe fuscous distally from the arculus *N. tillyardi* sp. n. (p. 258).

Notalina parkeri Mosely (figs. 170–173).

Notalina parkeri Mosely, 1936, *Trans. R. ent. Soc. Lond.*, 85 : 114–115, figs. 69–77.

Head black with greyish hairs. *Antennae* dark fuscous with indistinct darker annulations. *Wings* denuded in the examples under observation. *Legs*, femora dark fuscous, tibiae and tarsi pale cream-coloured. *Abdomen* dark fuscous with a pale, lateral, longitudinal stripe.

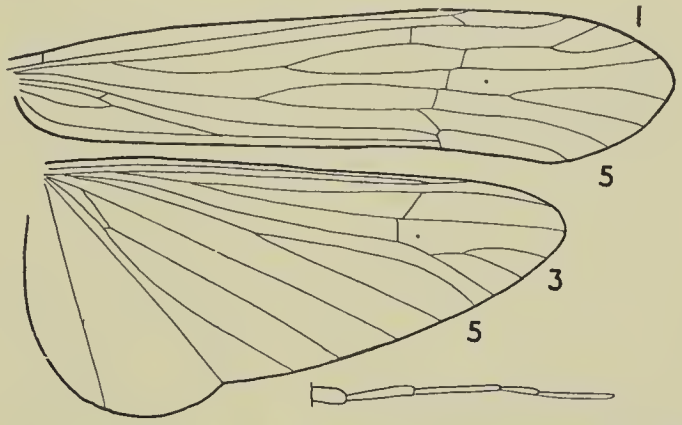

Fig. 170.—*Notalina parkeri* Mosely. ♂ wings and maxillary palp.

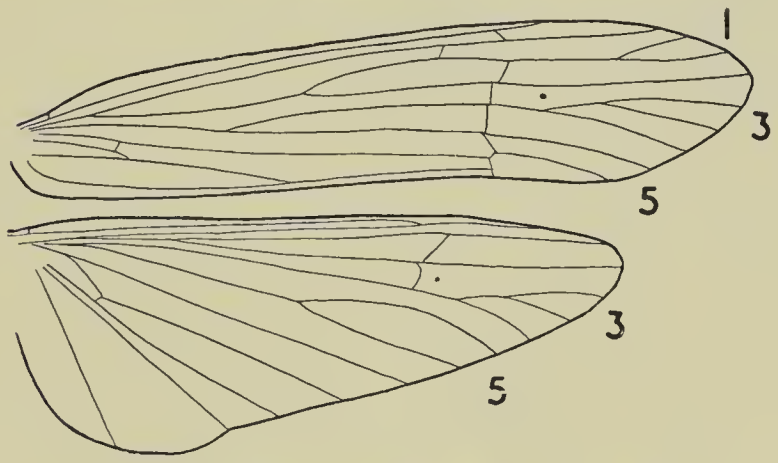

Fig. 171.—*Notalina parkeri* Mosely. ♀ wings.

Genitalia, ♂.—Apical margin of the ninth tergite excised at its centre with two small, triangular projections, one on each side of the excision. Superior appendages short and spindle-shaped, covered with long hairs ; apices acute. Beneath them, from above, is a large upper penis-cover ; apex excised to about half-way with a wide U-shaped excision. From the side the base of this cover is deep and the process narrows rather abruptly in a produced, finger-like apex. Penis, with a dilated, membranous apex as seen from beneath, is furnished with a pair of penis-sheaths arising towards the base and pressed against the under surface, each inclining slightly inwards. Inferior appendages inclining slightly

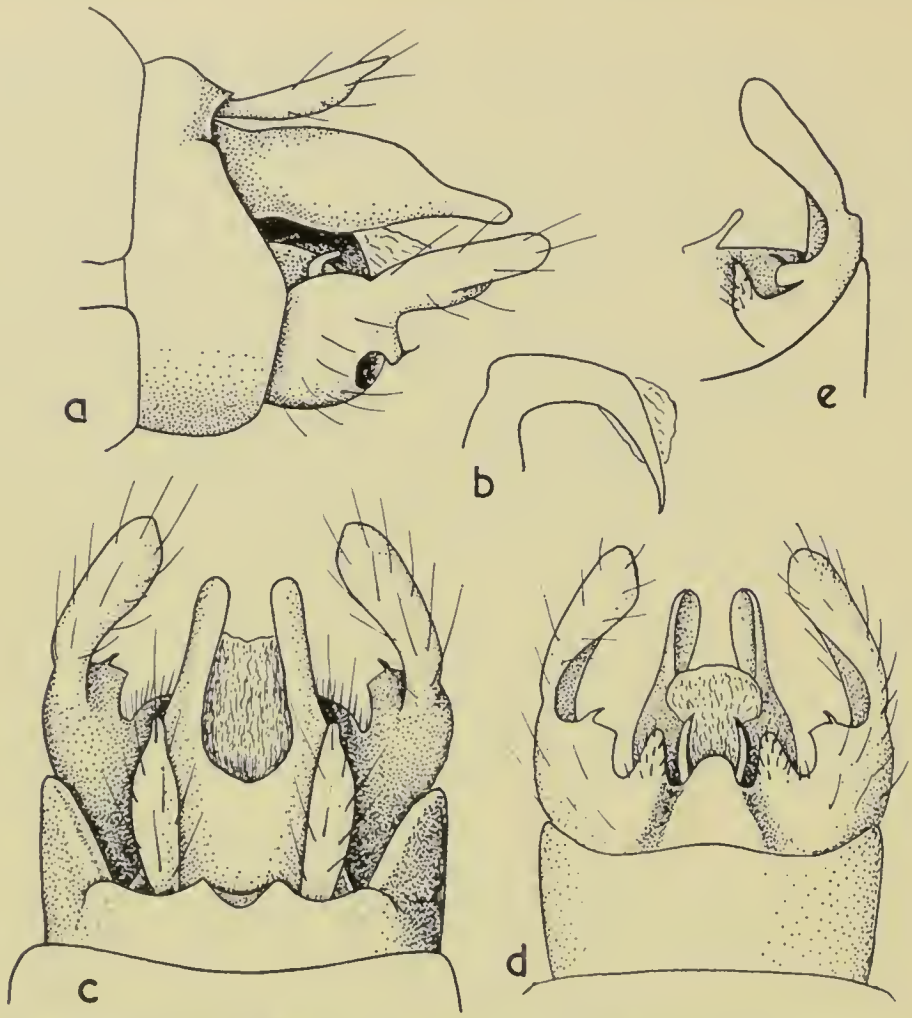

FIG. 172.—*Notalina parkeri* Mosely. ♂ genitalia. *a*, lateral; *b*, penis, lateral; *c*, genitalia, dorsal; *d*, ventral; *e*, inferior appendage, from behind.

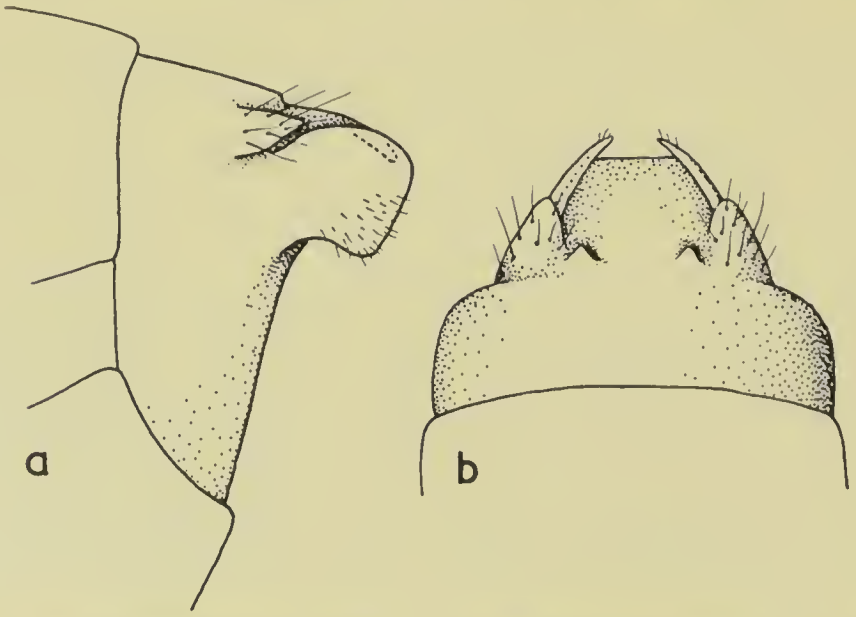

FIG. 173.—*Notalina parkeri* Mosely. ♀ genitalia. *a*, lateral; *b*, dorsal.

towards each other, four-branched, the main and outer branch large, concave and, as seen from beneath, dilated before the apex. Seen from beneath, towards the base of each appendage is a small, rectangular branch with the outer apical angle produced in a short spine. At the extreme base is a third branch, also very short, set with short, fine hairs and directed slightly upward. The fourth branches are very short and set far back on the upper margins of the bases of the appendages ; they are strongly chitinized and lie on each side of the penis, directed outward. The bases of the appendages, from beneath, appear to join to form a large, triangular tongue with a rounded apex lying between them.

Genitalia, ♀.—The terminal segment, from above, bears two pairs of small, triangular processes, the outer pair much larger than the inner ; the tubular piece is formed by four plates, the two side plates being large and somewhat quadrate.

Length of the anterior wing, ♂, 12 mm. ; ♀, 9·5 mm.

Tasmania : Great Lake, Miena, i.1930, i, 1931, C. Parker.

Type, ♂, in the British Museum (N.H.).

Notalina moselyi sp. n. (Kimmins) (figs. 174, 175).

Body colour ochraceous. *Head* with yellowish hairs ; on each side of the face a tuft of brownish hairs. *Maxillary palpi* with brownish and yellowish hairs. *Antennae* finely annulated with fuscous toward the base. *Legs* testaceous. *Anterior wing* clothed with yellowish and brownish pubescence, the brown hairs arranged to form small irrorate spots, chiefly along the nervures. A noticeable fuscous spot on the marginal fringe at the arculus. Neuration much the same as in *N. parkeri*. Anterior wing a little narrower, posterior with a well-marked anal lobe, the excision of the margin defining it almost a right-angle.

Genitalia, ♂.—From above, dorsal part of the ninth segment membranous, with two minute, membranous fingers arising at the centre of its distal margin. The superior appendages are long and slender ; beneath them is the upper penis-cover, deeply excised to leave a pair of narrow, pointed processes, separated from each other by a wide excision. Penis straight, membranous, with a pair of sheaths, whose long, strongly chitinized apices are directed downwards. Inferior appendages long, slightly dilated towards the apex, each roundly excised on the inner margin towards the base, with a sharp spur directed tailward at the lower end of the excision ; in ventral aspect this spur curves outward instead of inward as in *parkeri*. Arising at the base of the appendage is a rounded process fringed with long hairs.

♀ Smaller than ♂ ; anterior wings marked in a similar manner ; posterior wing much narrower, and fork no. 5 is shorter.

Genitalia.—Ninth segment with the dorsal margin produced in a thin rounded plate, with above it on each side a pair of triangular processes, the outer larger and fringed, the inner minute. Beneath this plate are a pair of quadrate valves, set on edge, directed slightly inwards and fringed with hairs.

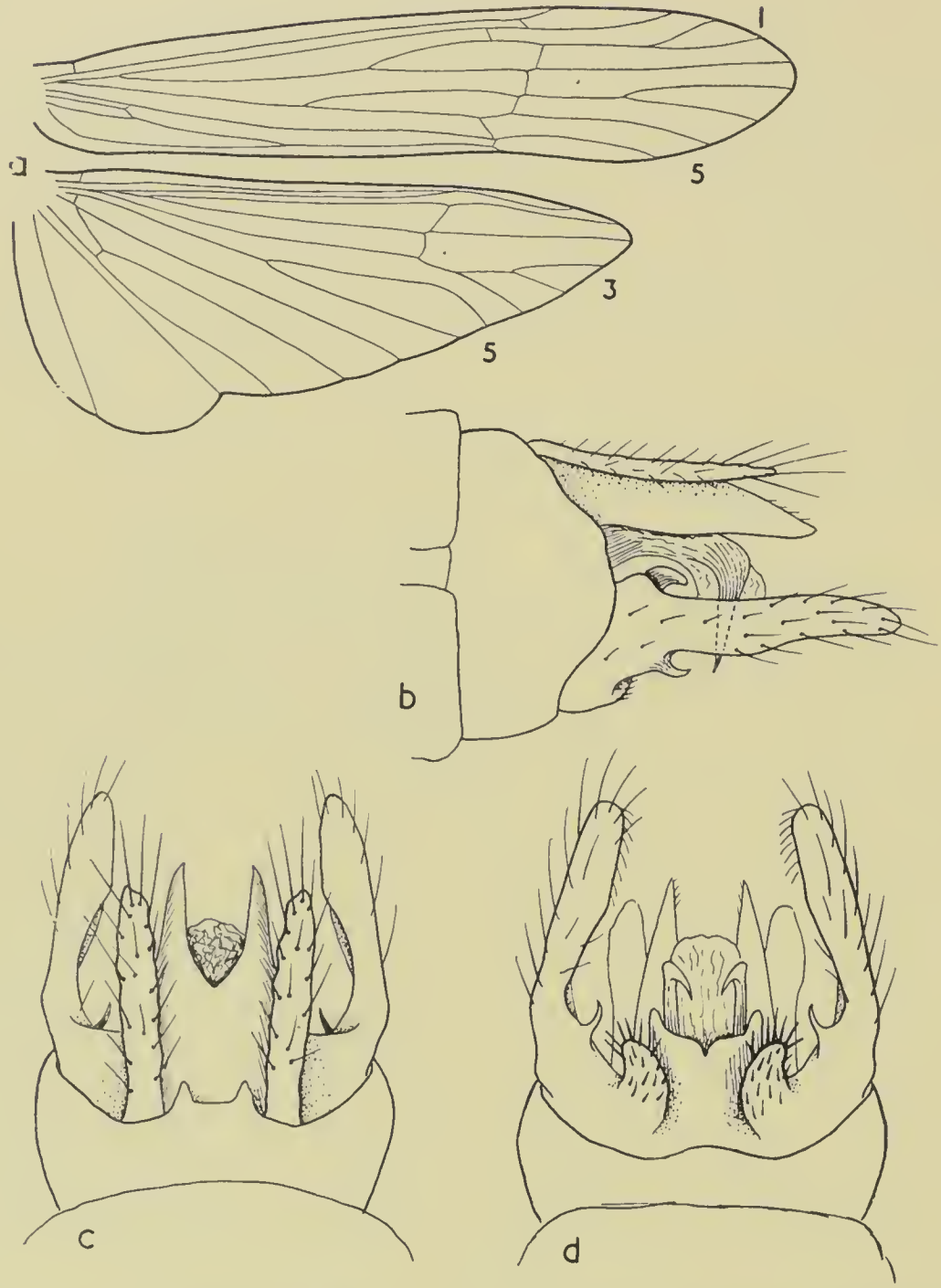

Fig. 174.—*Notalina moselyi* sp. n. ♂. *a*, wings; *b*, genitalia, lateral; *c*, dorsal; *d*, ventral.

Ventral margin of the ninth segment produced between these valves in a rounded lobe.

Length of anterior wing, ♂, 9 mm. ; ♀, 6–7 mm.

Australia : New South Wales, National Park, 29.iv.1916, 8.xi–3.xii.1916, 5 ♂, 4 ♀, R. J. Tillyard.

Type, ♂, with abdomen mounted in Canada balsam.

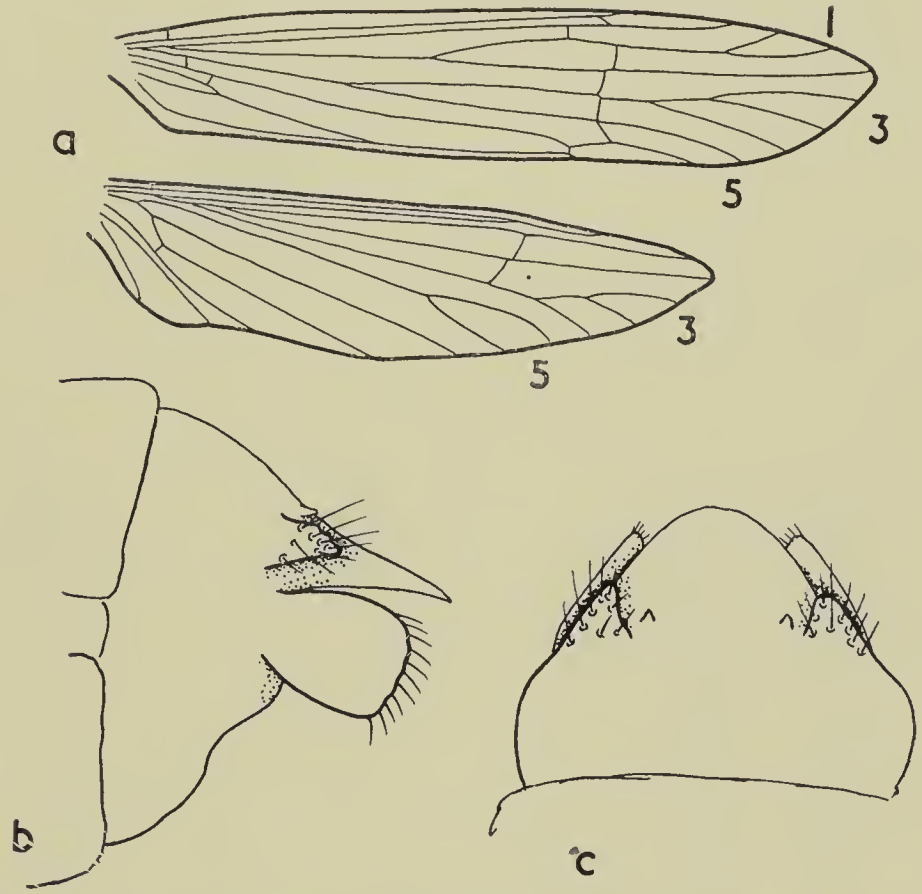

Fig. 175.—*Notalina moselyi* sp. n. ♀. *a*, wings ; *b*, genitalia, lateral ; *c*, dorsal.

This prettily-marked species is easily distinguished from all others in the genus by the irrorate wings, from the *parkeri* group by the acute apices of the upper penis-cover, and from *delicatula* and *flava* by the form of the inferior appendages.

Notalina flava (Ulmer) (figs. 176).

Triplectides flava Ulmer, 1908, in Michaelsen and Hartmeyer, *Fauna S.W. Austr.*, **2** (3) : 29–30, fig. 4.

Notalina flava Mosely, 1936, *Trans. R. ent. Soc. Lond.*, **85** : 117.

There are no examples of this species before me now, but the following is a free translation of Ulmer's description, including explanatory notes of my own as to his figures of the genitalia.

The species closely resembles *Triplectides delicatula*, but even at the first glance it can be distinguished by its brighter colour and also by the structure of the genitalia. The *body* is yellowish brown ; antennae yellowish brown, the fourth to about the twentieth joints with black annulations, the remaining joints darker and without annulations. *Legs* and *palpi* are dark yellow, the

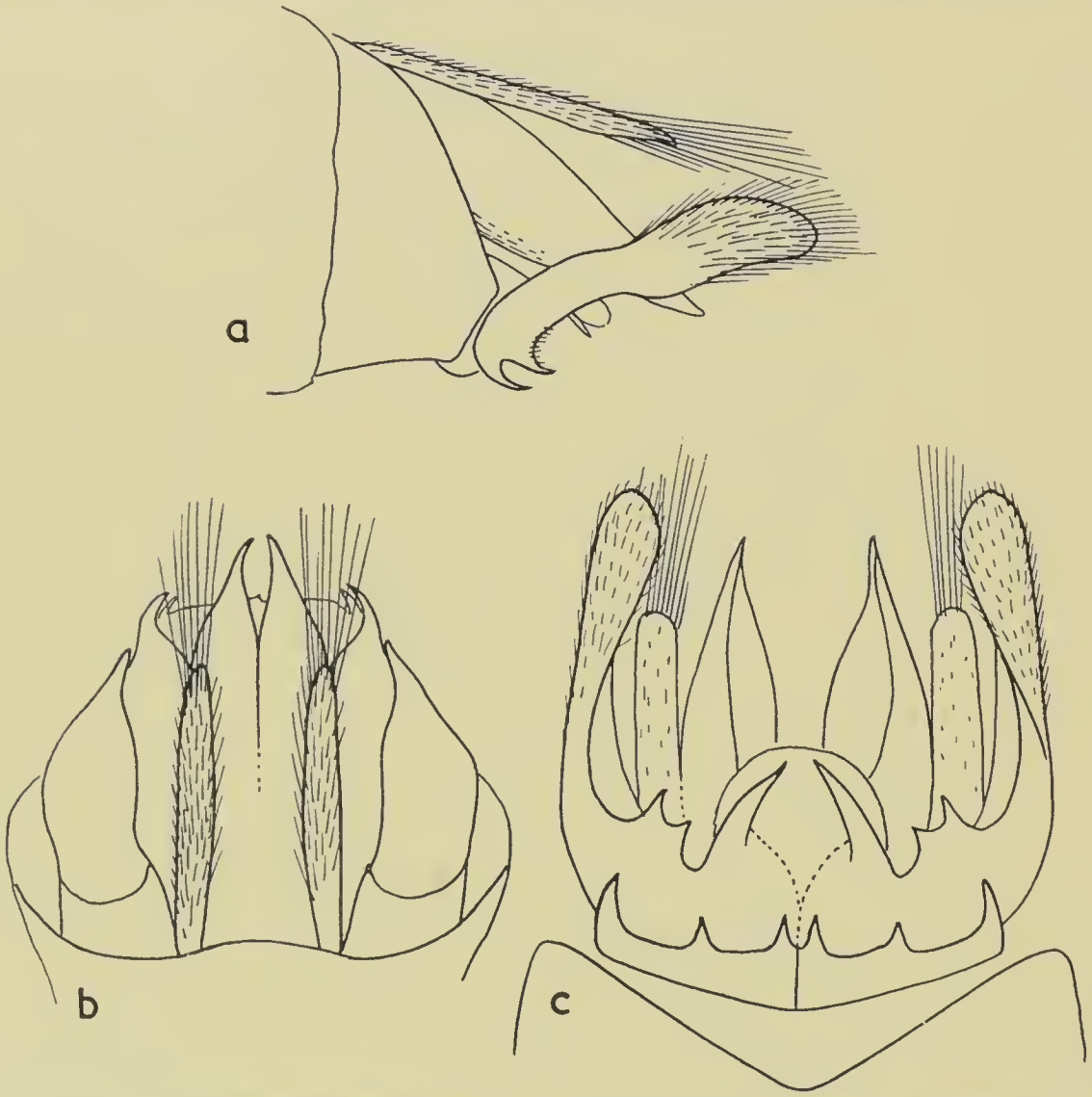

FIG. 176.—*Notalina flava* (Ulmer). ♂ genitalia (after Ulmer). *a*, lateral ; *b*, dorsal ; *c*, ventral.

palpi clothed with grey or yellow hair ; neuration as in *delicatula*. *Anterior wing* hyaline, clothed with short yellow hairs. *Posterior wing* lighter, iridescent, veins light brown ; fringes somewhat paler than in *delicatula*.

Genitalia, ♂.—From above, superior appendages long and slender ; beneath them is the upper penis-cover, which is long, terminating in an acute apex, which is deeply excised to leave a pair of needle-like processes directed slightly

towards each other. Inferior appendages long, slightly dilated at the apices, each with a long curved hook on the inner margin near the base seen from beneath, and a pair of smaller teeth separated from it by a narrow excision. These teeth are visible from the side as down-turned hooks. Ulmer describes the appendage, " inner branch wanting, but replaced by a wide shallow plate armed with three teeth." I think these plates represent the rounded knob found near the base in *delicatula* and stretch across towards each other to form a lower penis-cover.

Expanse, 22–23 mm.

S. W. Australia : Wooroloo, Serpentine R., 29.v.1905, 22–25.ix.1900 (Hamburg S. W. Australia Expedition).

Notalina delicatula (Ulmer) (fig. 177).

Triplectides delicatula Ulmer, 1908, in Michaelsen and Hartmeyer, *Fauna S.W. Austr.*, 2 (3) : 27–29, figs. 1–3.
Triplectides delicatula Ulmer, 1916, *Ark. f. Zool.*, (13) **10** : 17.
Notalina delicatula Mosely, 1936, *Trans. R. ent. Soc. Lond.*, **85** : 115–116, figs. 78–79.

The whole body dark brown. *Head*, basal joint of *antenna*, pronotum and the depressed centre of the mesonotum with bright gold or bright grey hairs. *Antenna* about three times the length of the anterior wing, towards the base somewhat dark brown, with narrow dark annulations at the joints. *Palpi* and *legs* brown, the former densely hairy. First joint of the *maxillary palpi* short, second and third long, fourth somewhat shorter, fifth longer than the fourth. *Spurs* 2, 2, 4 ; inner spurs rather longer than the outer. Hind tibiae slightly bent, with fine outstanding hairs. Middle and hind tarsi with fine spines.

Anterior wing long and narrow ; posterior wing with a broad basal area. Anterior wing membrane dark grey, with sparse, fine, yellowish pubescence and with some scattered dark hairs. The middle of the wing is hyaline from base to apex, which gives a good character for examples in alcohol. *Posterior wing* paler than the anterior, more transparent and iridescent, with sparser pubescence. Veins of both wings brown, distinct, except in the posterior, where the veins of the discoidal cell and its footstalk are paler and inconspicuous. Fringes of both wings yellowish, that of the hind wing along the hind margin darker and longer. Neuration regular, discoidal cell closed in both wings. In the fore wing forks nos. 1 and 5 present in the ♂, nos. 1, 3 and 5 in the ♀ ; in the hind wing forks nos. 3 and 5 present in both sexes ; one finds also examples with a long narrow fork no. 1 in the hind wing.

Genitalia, ♂.—Genitalia and last abdominal segments darker than body. Superior appendages straight, rod-like, not tapered, apex with long hairs. Upper penis-cover with an excision which is broader at its base, apices of the cover slightly widened. Beneath the cover can be seen two chitinized spines, belonging to the penis. Inferior appendages arising from a broad base, strongly narrowed. At the base is a broad, blackish, strongly pubescent, angular process, forming an inner branch. In fluid examples this process

appears quadrate, in dry examples more or less rounded and clavate ; near its base the main branch of the inferior appendage carries a strong internal tooth, mostly only visible in ventral aspect.

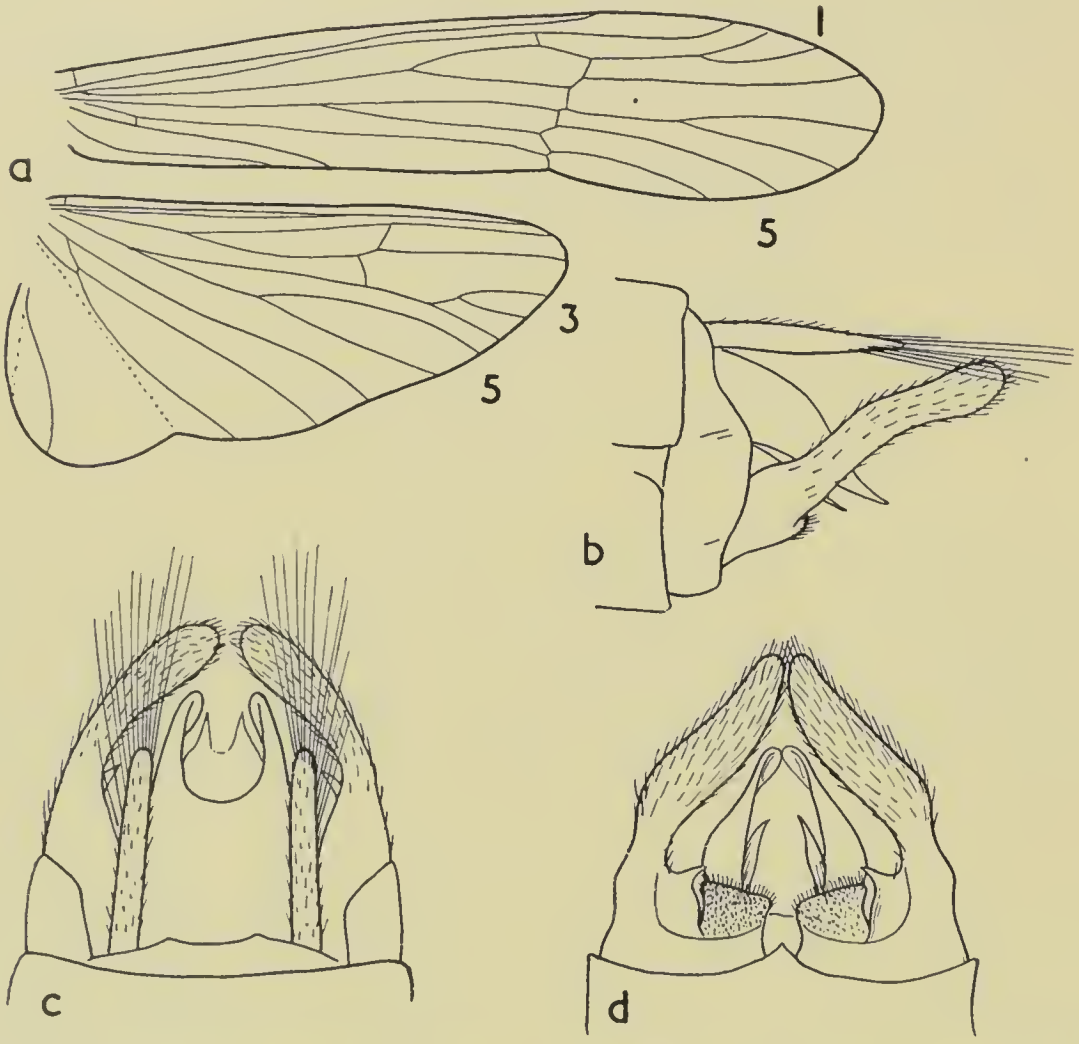

Fig. 177.—*Notalina delicatula* (Ulmer). ♂ (after Ulmer). *a*, wings ; *b*, genitalia, lateral ; *c*, dorsal ; *d*, ventral.

The abdomen of the female terminates in a dorsal, thin, rounded plate, under which (as in *Mystacides*) two dorso-ventrally set, circularly dilated lobes are found, all dark yellow, as is the entire abdomen ; on the dorsal plate are two elongate triangular appendages of darker colour.

Expanse of wings, 18 mm.

S. W. Australia : Lion Mill, 11.x.1905, Serpentine, R. Serpentine, 23–25.ix.1905, Brunswick, 7.x.1905, Hamburg S. W. Australia Expedition.

[A ♂ without abdomen and several females from W. Australia : Yanchep 32 miles N. of Perth, 20–31.xii.1935, R. E. Turner, are provisionally placed here.—D. E. K.]

Notalina fulva sp. n. (Kimmins) (fig. 178).

Head light ochraceous, with whitish hairs. *Antennae* light ochraceous, finely annulated with fuscous at the joints. *Anterior wing* clothed with luteous or fulvous pubescence, the fringe fuscous at the arculus, making a

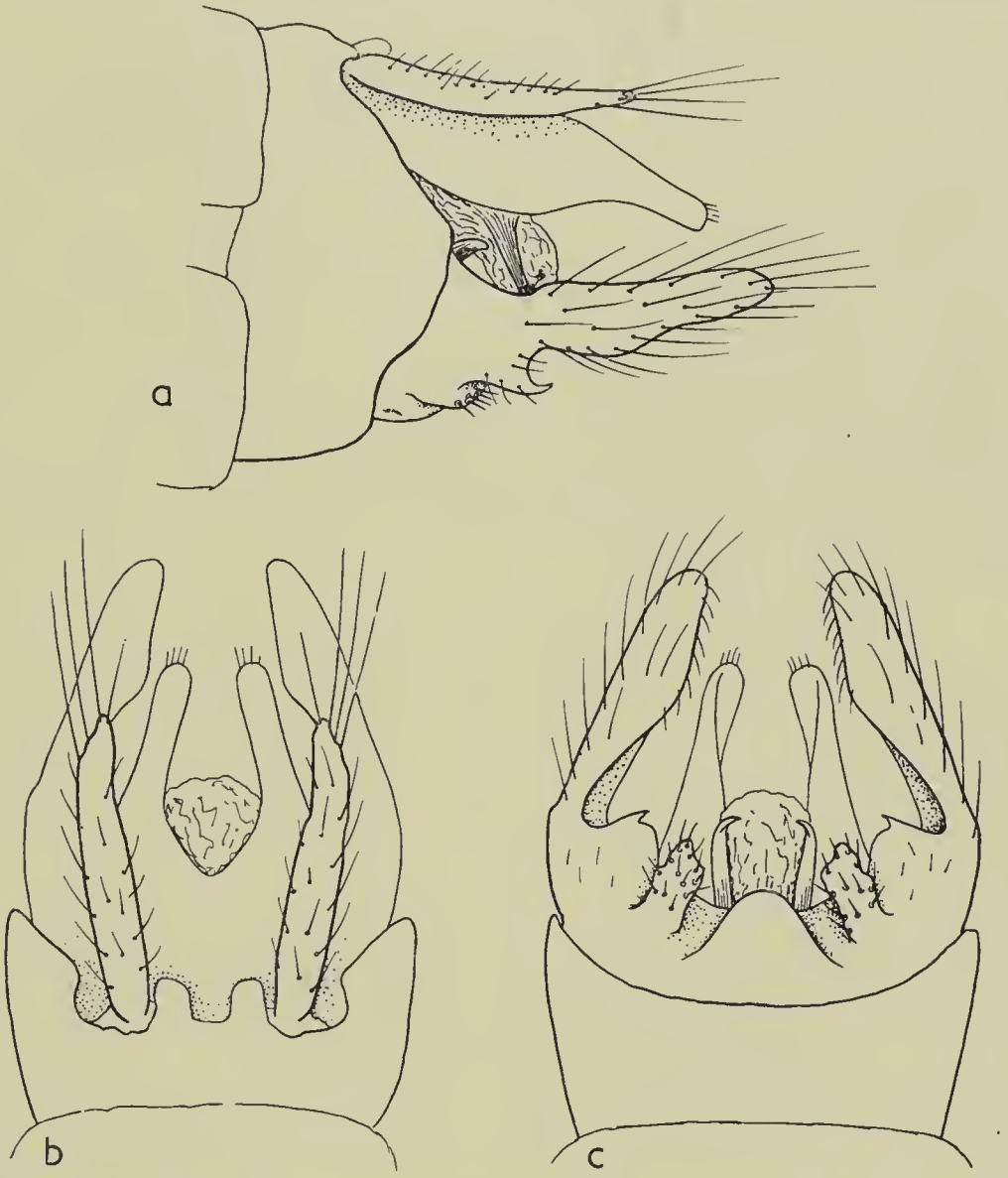

FIG. 178.—*Notalina fulva* sp. n. ♂ genitalia. *a*, lateral; *b*, dorsal; *c*, ventral.

conspicuous spot in undenuded examples. *Posterior wing* lightly clothed with luteous pubescence. Neuration much as in *N. parkeri*; in some examples the thyridial cell extends further basally than in *parkeri*, but this does not seem to be a constant feature.

Genitalia, ♂.—Very similar to *N. parkeri*. The superior appendages are longer and more slender. The upper penis-cover is more arched downward

towards the apex. In the inferior appendages the rectangular branch carrying a small spur is, from the side, acute rather than quadrate ; the third branch is more irregular in outline, as seen from beneath.

Length of anterior wing, ♂, 10–16 mm. ; ♀, 7·5–9 mm.

Australia : Victoria, Gisborne, 7.xi.1915, 1 ♂ (*type*), G. Lyell ; Fernshaw, 21.xii.1884, 1 ♀, McLachlan Collection ; Oakleigh, 1 ♂. New South Wales, Sydney, 4.x.1884, 3 ♂, Bathurst, 2300 ft., 8.ii.1884, 1 ♀, McLachlan Collection ; National Park, 29.iv.1916, bred, 9.xii.1916, 1 ♂, 1 ♀, Glen Innes, 27.iv.1916, 2 ♂, 1 ♀, Hampton, i.1916, 1 ♂, 2 ♀, Mt. Kosciusko, 4000 ft., 28.i.1914, 1 ♂, Heathcote, 4.ii.1916, 1 ♀, Tabulam, 29–30.xii.1912, 2 ♂, R. J. Tillyard.

Tasmania : Deloraine, 27.xii.1884, 1 ♂, McLachlan Collection ; Perth, 14.i.1917, 1 ♂, F. M. Littler ; St. Patrick's R., 8.ii.1914, 2 ♂, Hobart, 29.i.1917, 1 ♂, North Esk, 21.i.1923, 1 ♂, R. J. Tillyard ; Lake St. Clair, ii.1941, 1 ♂, J. W. Evans.

On the basis of genitalia alone one might be inclined to consider this species to be *N. parkeri* Mosely, but the general appearance is strikingly different. *N. parkeri* is predominantly fuscous, whereas this species is light tawny in colour. Mr. Mosely had tentatively placed these examples over the label *delicatula* Ulmer, but I consider the difference in the ♂ genitalia and the locality sufficient to warrant their separation.

Notalina tillyardi sp. n. (Kimmins) (fig. 179).

Body mainly fulvous. *Head* with ochraceous hairs, *antennae* ochraceous with fine fuscous annulations basally. *Anterior wing* with fulvous pubescence, marginal fringes distally from the areulus fuscous. Membrane of anterior wing pale fuscous, with whitish irrorations and with the apical area whitish. Neuration much as in *N. parkeri* ; anal lobe of *posterior wing* a little more pronounced in the male.

Genitalia, ♂.—Margin of ninth dorsal segment excised ; superior appendages moderately long, finger-like ; upper penis-cover longer than superior appendages, from above excised to leave two slightly convergent arms, from the side broad at the base, tapering beyond midway to a narrow, parallel-sided, truncate apex. Penis and sheaths much as in *N. parkeri*. Inferior appendages of the pattern of *N. parkeri*, but differing in side-view. The rectangular projection about mid-way in that species is reduced to an inconspicuous acute spur. In ventral view the inferior appendages are less incurved and more slender. The third branch, set with bristles, is directed distally rather than upward.

Length of anterior wing, ♂, 12–13 mm. ; ♀, 10–11 mm.

Tasmania : Sheffield, 8.i.1917, 3 ♂, 3 ♀, R. J. Tillyard.

Type, ♂, pinned, paratype with abdomen mounted in balsam.

This species is obviously closely related to *N. parkeri* in the male genitalia, and together with *N. fulva* might be considered as sub-species. Both it and *N. fulva* can be distinguished at a glance from *N. parkeri* by the paler colouring. The differences in genitalia are less marked, and require the making of preparations.

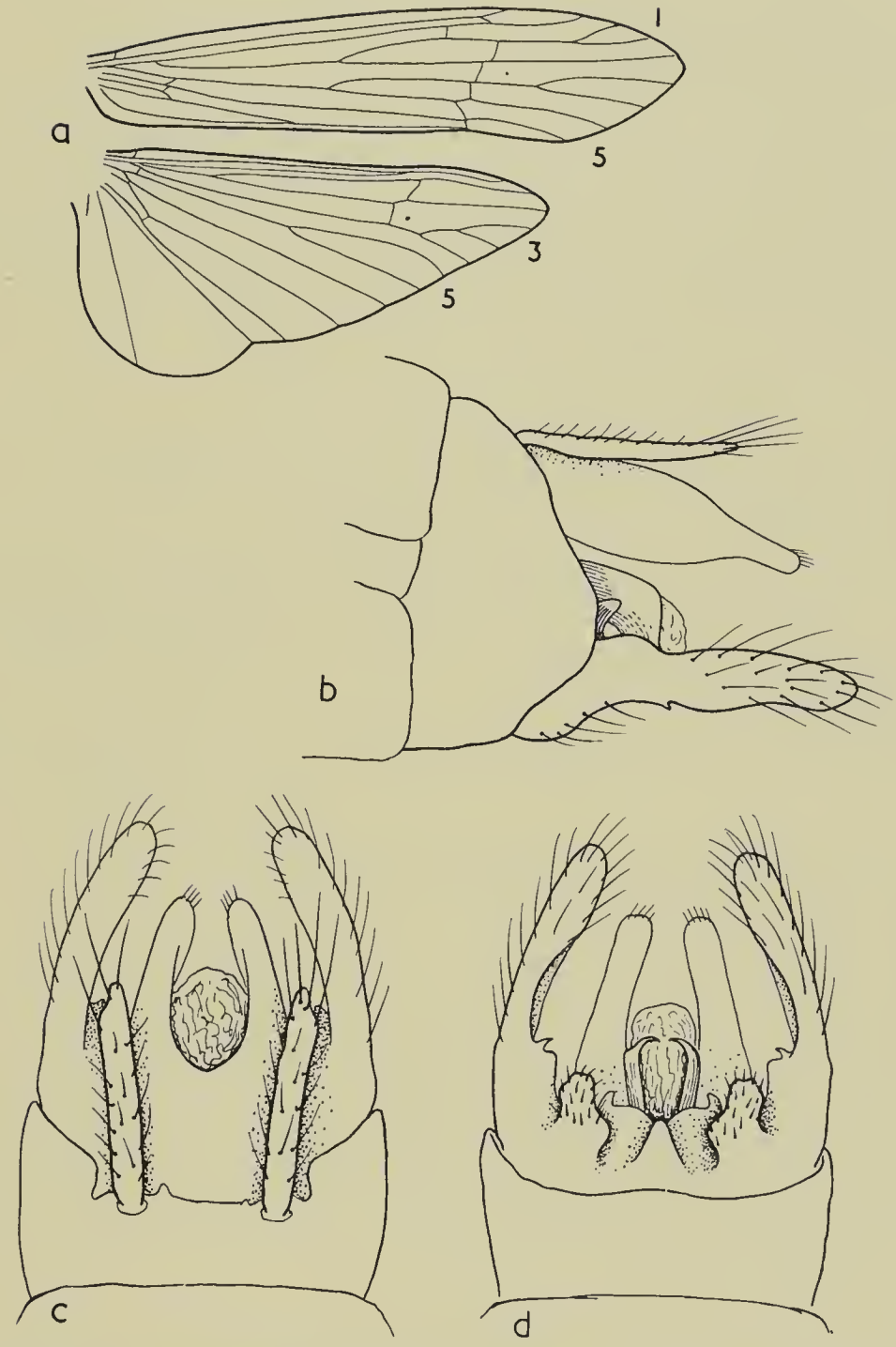

FIG. 179.—*Notalina tillyardi* sp. n. ♂. *a*, wings; *b*, genitalia, lateral; *c*, dorsal; *d*, ventral.

Symphitoneuria Ulmer.

Symphitoneuria Ulmer, 1906, *Notes Leyd. Mus.*, 28 : 31.
Symphitoneuria Ulmer, 1907, *Gen. Insect.*, 60a : 131–132, pl. 18, fig. 15.
Symphitoneuria Mosely, 1936, *Trans. R. ent. Soc. Lond.*, 85 : 117.
Loticana Mosely, 1936, l.c. : 121 (Syn. nov.).

In the *anterior wing* neuration towards the post-costal half irregular in the male, media merging in the sector along the lower margin of the discoidal cell, regular in the female. Fork no. 5 in the male extending to the base of the discoidal cell. Posterior wing with forks nos. 3 and 5, the cell below fork no. 3 reaching beyond the cross-vein below the discoidal cell. Male genitalia conforming generally to the *Triplectides* pattern. *Spurs* 2, 2, 2.

Type species.—*Leptocerus exiguus* McLachlan, 1862.

Key to Species of *Symphitoneuria*.

1. Males . . . . . 2.
–. Females . . . . . 4.
2. Inferior appendage stout, with second branch almost entirely fused to main branch . . . . . *S. wheeleri* Banks (p. 268).
–. Inferior appendage with second branch free, claw-like . . . . . 3.
3. Upper penis-cover from side projecting beyond inferior appendage ; fork no. 1 in anterior wing with a short footstalk . . *S. exigua* (McLachlan) (p. 260).
–. Upper penis-cover about as long as inferior appendage ; fork no. 1 in anterior wing sessile . . . . . *S. opposita* (Walker) (p. 263).
4. Ninth sternite smoothly rounded . . . *S. opposita* (Walker) (p. 263).
–. Ninth sternite not smoothly rounded . . . . . 5.
5. Ninth sternite with a large V-shaped excision . . *S. wheeleri* Banks (p. 268).
–. Ninth sternite produced at its centre, with a minute median excision *S. exigua* (McLachlan) (p. 260).

Symphitoneuria exigua (McLachlan) (figs. 180–182).

Leptocerus exiguus McLachlan, 1862, *Trans. ent. Soc. Lond.*, (3) 1 : 307.
Leptocerus exiguus McLachlan, 1866, *Trans. ent. Soc. Lond.*, (3) 5 : 257.
Symphitoneuria exigua Ulmer, 1906, *Notes Leyd. Mus.*, 28 : 31–32, fig. 40.
Symphitoneuria exigua Ulmer, 1907, *Gen. Insect.*, 60a : 132, pl. 18, fig. 165.

McLachlan's original description is as follows :

" Antennae whitish, with an ochreous tinge, in the basal third finely and distantly annulated with black ; eyes brownish-black ; head and thorax ferruginous ; abdomen darker ; legs pale whitish-ochreous ; anterior wings somewhat transparent, not very thickly clothed with tawny hairs, veins ochreous ; posterior wings more transparent, beautifully iridescent, reflecting various colours."

" Long. corp. 3 lin.; exp. alar. $7\frac{1}{2}$ lin."

" Australia (Moreton Bay)."

Length of the anterior wing, ♂, 9 mm. ; ♀, 11 mm.

To this I add :

In the *anterior wing*, ♂, discoidal cell long and narrow. Fork no. 1 with a short footstalk (sessile in *opposita*). There is a succession of four veins arising from the lower margin of the discoidal cell, more or less abruptly bent near the point of origin and passing to the distal margin of the wing ; of these

the basal vein is less abruptly bent than in *opposita*. In the *posterior wing* the cell below fork no. 3 reaches well beyond the cross-vein, whereas in *opposita* it only just reaches it ; the base of this cell in *exigua* reaches almost as far as the base of fork no. 5 ; in *opposita* it terminates some little distance before the base of fork no. 5.

In the ♀, *anterior wing*, fork no. 1 with a short footstalk (sessile in *opposita*) ; discoidal cell long and narrow. Cellula thyridii very long, base projecting considerably beyond the base of the discoidal cell (further than in *opposita*). In the *posterior wing* the cell below fork no. 3 reaches beyond the cross-vein (in *opposita* it only just reaches the cross-vein).

Genitalia, ♂.—From above, distal margin of the ninth segment produced in a wide triangle ; superior appendages thimble-shaped, set rather far apart.

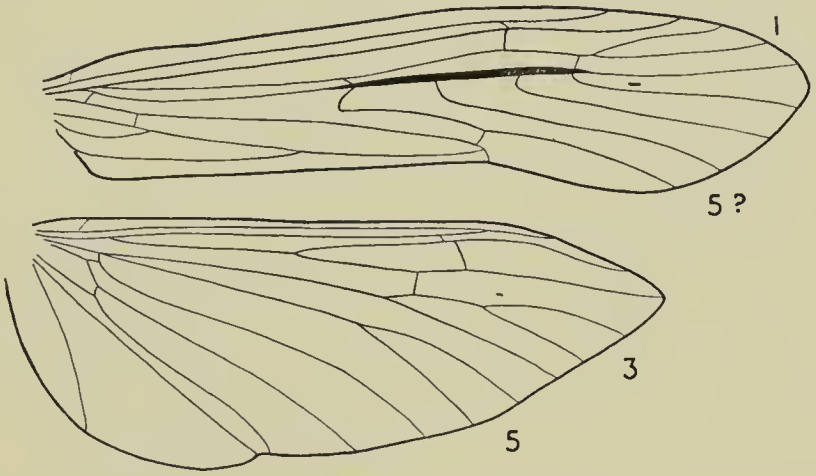

Fig. 180.—*Symphitoneuria exigua* (McLachlan). ♂. Anterior wing of type and posterior wing of paratype.

Upper penis-cover very large, broad at the base and rather abruptly tapering to a cleft apex. Penis short, dilated before the apex, which is set on a narrow neck, and is widely excised at its distal margin and directed downward. Inferior appendages three-branched, only about half as long as the upper penis-cover. Upper and median branches of about the same length ; upper branch with rounded apex and with a small, rectangular plate about mid-way, directed inwards ; median branch with a claw-shaped apex. The inner plates of the appendages rather small and rounded. Basal branches long, widely divergent. A small, triangular projection at the centre of the margin of the ninth ventral segment.

Genitalia, ♀.—From above, ninth segment is produced at the centre of its distal margin in a broad, crown-shaped plate, from below the angles of which project two rounded valves, furnished with long hairs, inclining towards each other ; beneath these are two rather longer and divergent, oval plates, apices heavily fringed. Eighth sternite with its distal margin closely fringed and excised at its centre.

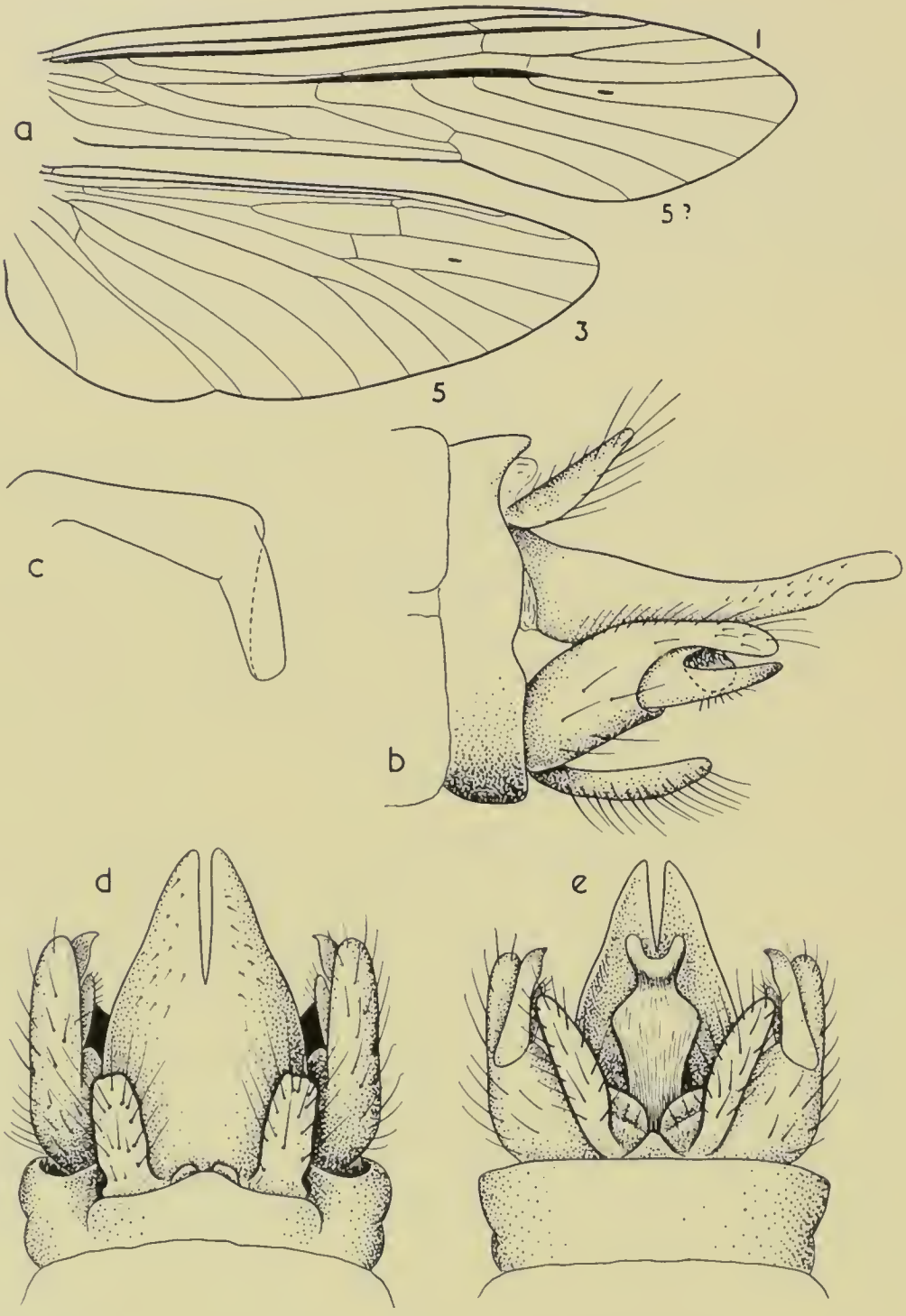

FIG. 181.—*Symphitoneuria exigua* (McLachlan). ♂ (Tambourine Mts. example). *a*, wings; *b*, genitalia, lateral; *c*, penis, lateral; *d*, genitalia, dorsal; *e*, ventral.

Type and paratype, ♂, the type with the posterior wings and abdomen wanting, and the paratype with the abdomen wanting, in the British Museum (N.H.). Other examples from Australia : S. E. Queensland, Tambourine Mts., 19–26.iv.1935, R. E. Turner ; Coolangatta, 10.ix.1921, 6.ix.1913; Brisbane, 2–28.ix.1913.

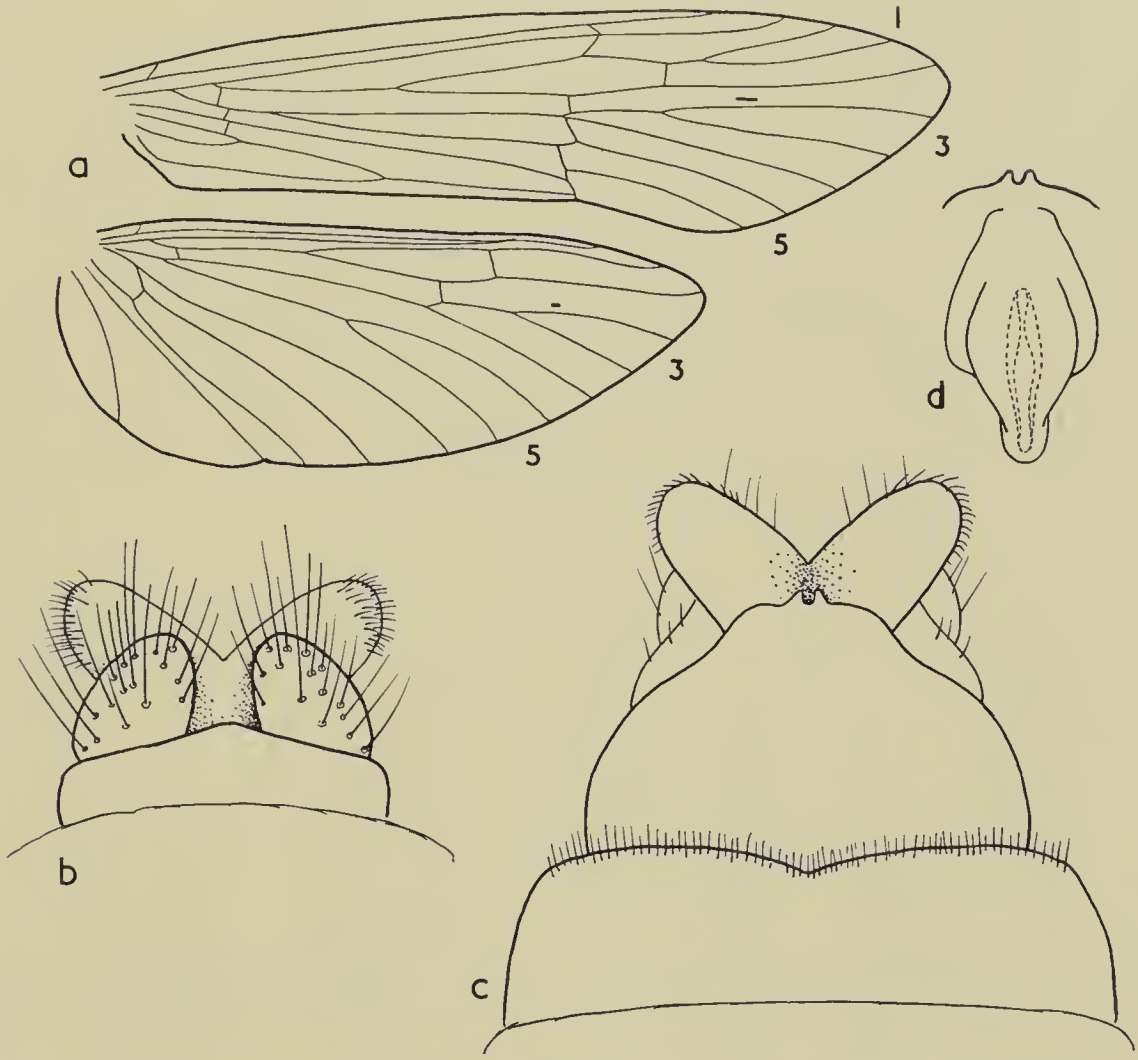

Fig. 182.—*Symphitoneuria exigua* (McLachlan). ♀. *a*, wings ; *b*, genitalia, dorsal ; *c*, ventral ; *d*, vaginal structure, ventral.

The figures here given are, as to the wings, from the type and paratype from Moreton Bay. The wings and genitalia of the example from the Tambourine Mts. are also figured. The female has been figured from the example from Coolangatta, 6.ix.1913.

Symphitoneuria opposita (Walker) (figs. 183–185).

Leptocerus oppositus Walker, 1852, *Cat. Neur. Brit. Mus.*, 1 : 73.
Leptocerus oppositus Hagen, 1864, *Verh. Zool. Bot. Ges. Wien.*, 14 : 830.

Notanatolica opposita McLachlan, 1866, *Trans. ent. Soc. Lond.*, (3) 5 : 257.
Notanatolica opposita Ulmer, 1906, *Notes Leyd. Mus.*, 28 : 31–35.
Notanatolica opposita Ulmer, 1907, *Gen. Insect.*, 60a : 131.
Symphitoneuria exigua Ulmer *nec* McL., 1907, *Coll. Selys*, 6 (1) : 41.
Notanatolica opposita Banks, 1913, *Proc. ent. Soc. Wash.*, 15 : 176.
Notanatolica opposita Döhler, 1915, *Deutsch. ent. Zeitschr.*, 1915 : 406.
Notanatolica opposita Banks, 1916, *Phillipp. Journ. Sci.*, 11(3) : 213.
Notanatolica opposita Ulmer, 1916, *Ark. Zool.*, (13) 10 : 17–18, fig. 22
Notanatolica opposita Ulmer, 1930, *Treubia*, 11 : 404, 462.
Notanatolica opposita Martynov, 1931, *Mem. Mus. Hist. Nat. Belg.*, 4 (2) : 15.
Loticana opposita Mosely, 1936, *Trans. R. ent. Soc. Lond.*, 85 : 121, figs. 91–94.
Symphitoneuria exigua Mosely *nec* McL. *partim* ♂ genitalia and figs. only, 1936, *Trans. R. ent. Soc. Lond.*, 85 : 118.
Loticana opposita Betten and Mosely, 1940, *F. Walker Types Trich., Brit. Mus.* : 234–236, fig. 119.

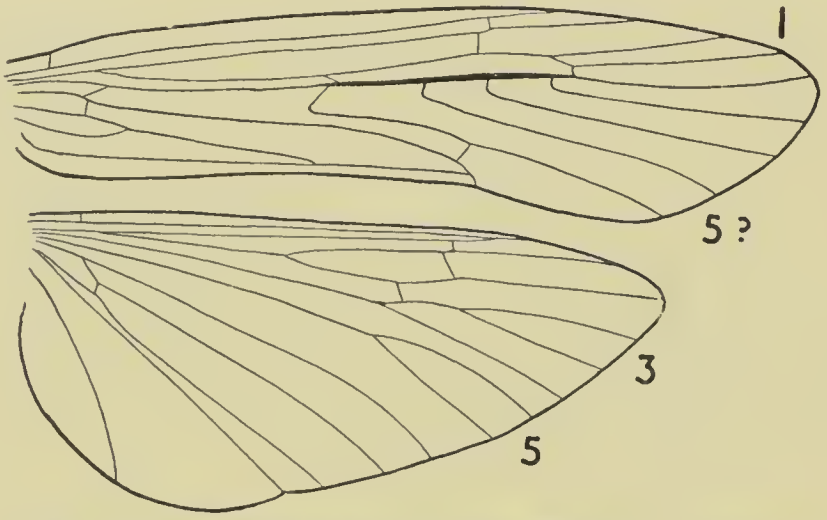

Fig. 183.—*Symphitoneuria opposita* (Walker). ♂ wings.

Walker describes the species as follows :

" Ferruginous. blackish beneath, clothed with pale hairs : antennae pale testaceous, almost whitish, full thrice the length of the body : legs testaceous : wings gray, slightly clothed with pale brown down ; veins pale. Length of the body 2½–3 lines ; of the wings 10–11 lines."

Length of the anterior wing, ♂, 12 mm. ; ♀, 11 mm.

To this may be added :

In the *anterior wing*, ♂, fork no. 1 sessile ; discoidal cell long and narrow, the vein below its base very acutely bent back, slightly more acutely than in *Symphitoneuria exigua* McLachlan. In the *posterior wing*, fork no. 3 about the same length as its footstalk. The apical cell below fork no. 3 only just reaches the cross-vein.

In the *anterior* wing, ♀, the discoidal cell is normal in shape. Forks nos. 1, 3, 5 present, fork no. 1 sessile. *Posterior wing*, forks nos. 3 and 5 present. A cross-vein unites R_1 with the sector ; cell M_2 reaches the cross-vein *r–m*.

Genitalia, ♂.—From above, distal margin of the ninth segment produced at its centre to make a wide, shallow triangle ; lateral angles also produced. Superior appendages short, dilating gradually towards their apices. Upper penis-cover very long, rather broad ; apex deeply cleft, small triangular projections towards the base of the lateral margins. Penis short, apex slightly

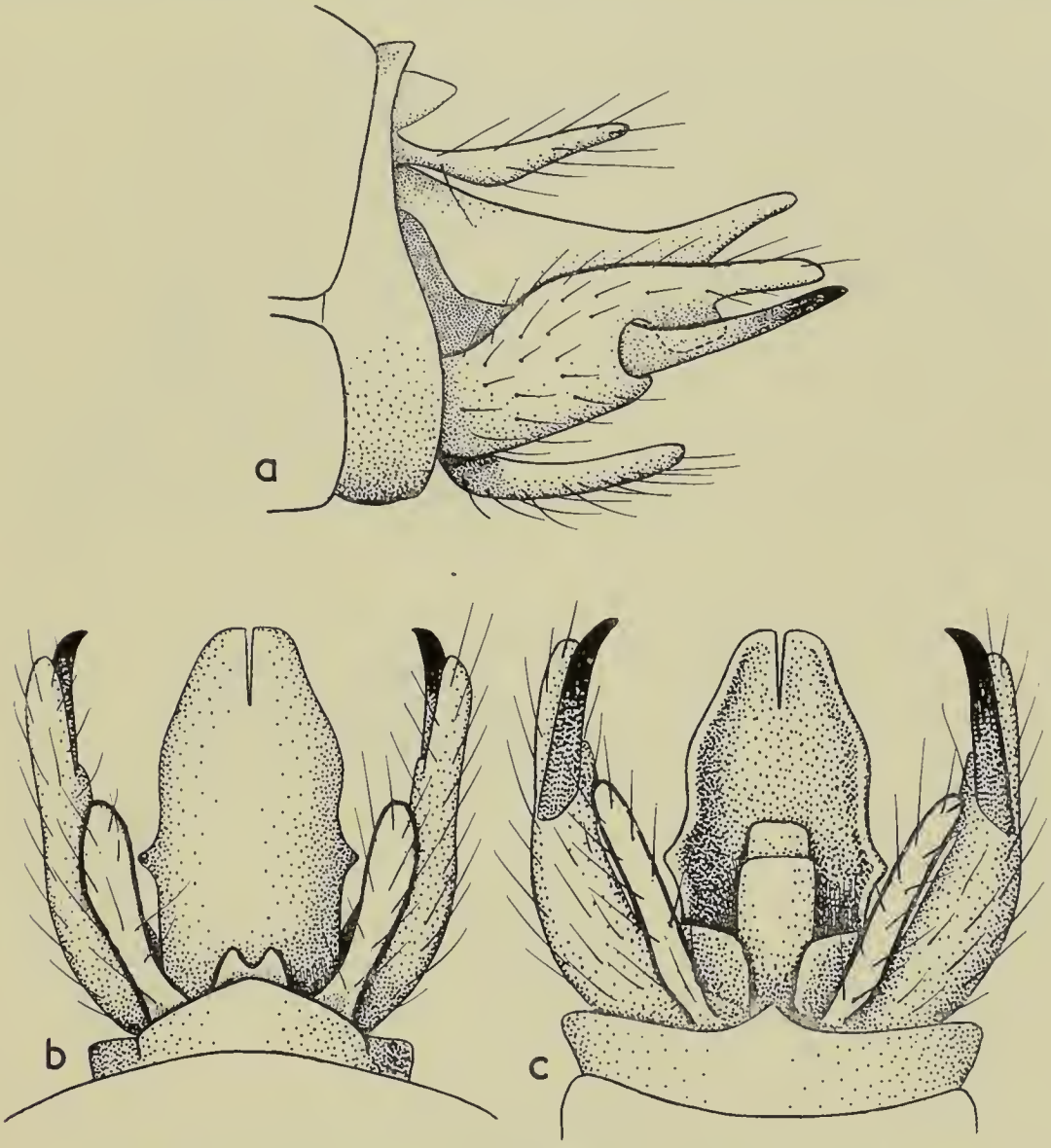

Fig. 184.—*Symphitoneuria opposita* (Walker). ♂ genitalia. *a*, lateral ; *b*, dorsal ; *c*, ventral.

excised, with a semi-transparent and shorter plate closely adpressed beneath. Inferior appendages three-branched, the main or upper branch very slightly shorter than the second, which terminates in a claw-shaped apex. In all the other genera in which this pattern of inferior appendages is found, the second branch is the shorter. Arising from the inner and lower margin of the first

branch, just above the point of juncture of the second, is a small, rectangular plate, directed inwards and downwards, apical margin somewhat serrate and fringed with stiff hairs. The third branches arise at the bases of the appendages, their apices extending as far as the rectangular plate ; also at the bases of the appendages, extending inwards, is a pair of large, rounded

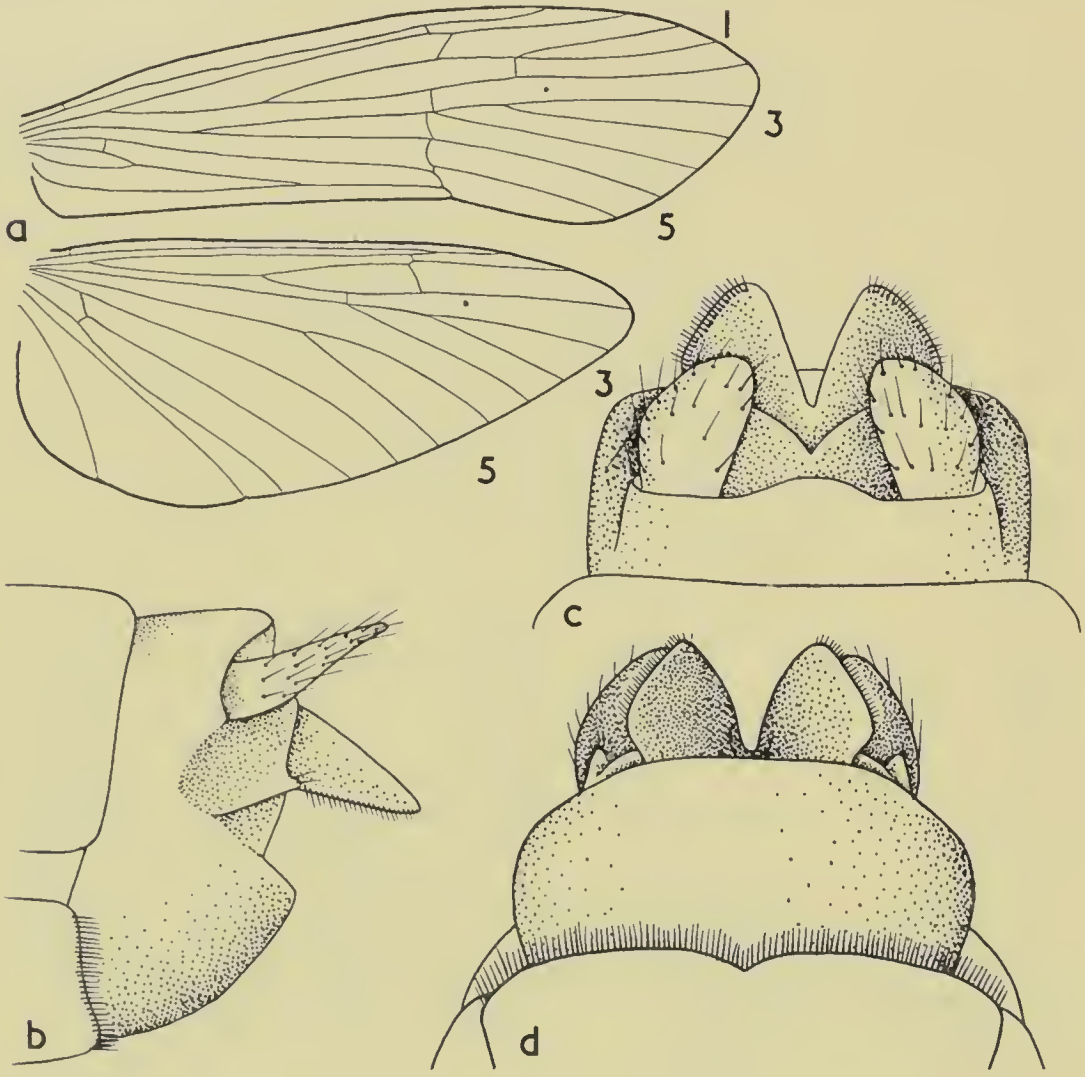

Fig. 185.—*Symphitoneuria opposita* (Walker). ♀ type. *a*, wings ; *b*, genitalia, lateral ; *c*, dorsal ; *d*, ventral.

lobes corresponding to the inner plates found in most, if not in all, species of *Triplectides*. Ventral margin of the ninth segment produced at its centre in a small triangle.

Genitalia, ♀.—From above, centre of the margin of the terminal dorsal segment produced ; there are two, rather broad, superior appendages, and beneath them are two triangular membranous processes, rather closely fringed;

between the superior appendages and these processes are plates, slightly produced from below, at the outer, and from the side, the lower angles. The eighth sternite is strongly chitinized and closely fringed, with a slight excision at the centre of its apical margin.

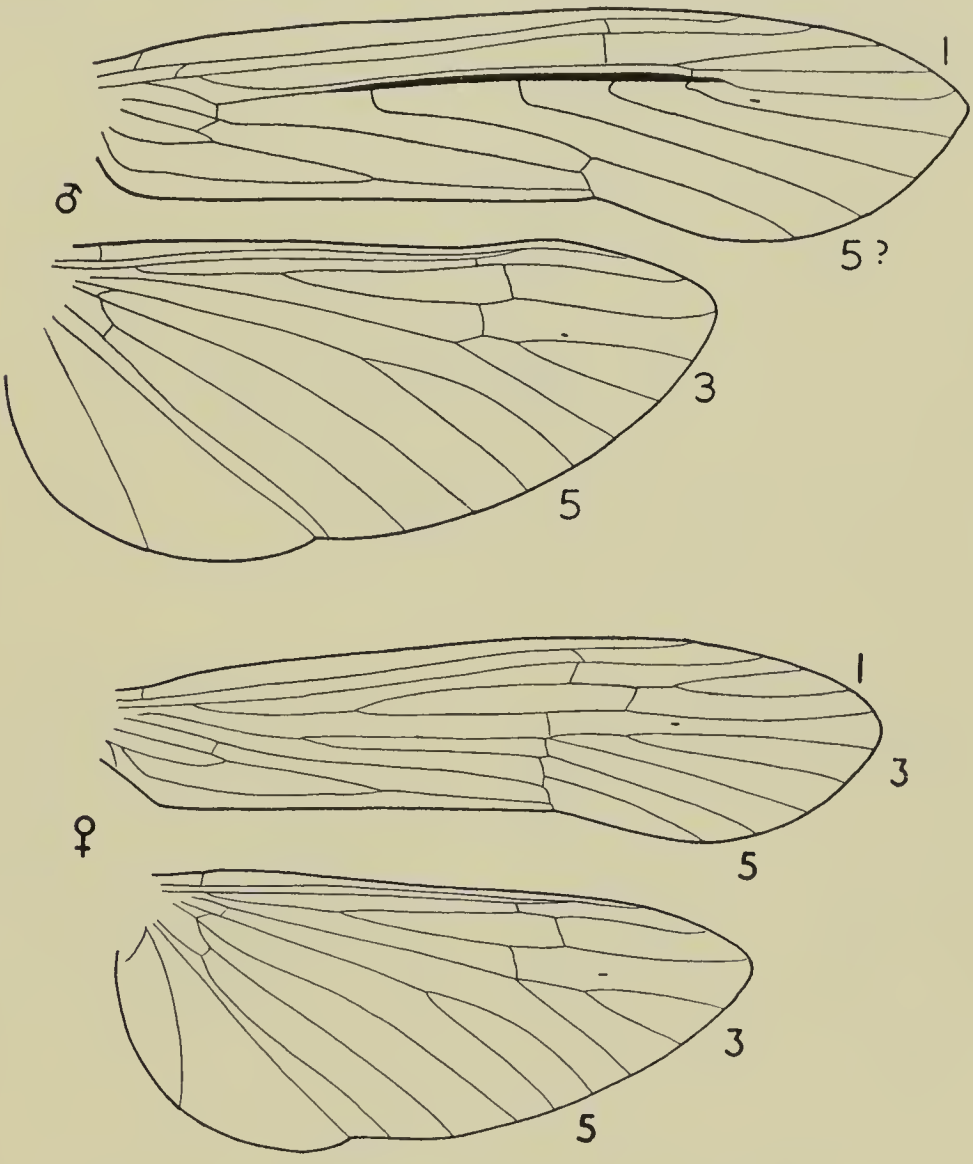

Fig. 186.—*Symphitoneuria wheeleri* Banks. ♂♀ wings.

Tasmania : *Type*, ♀. Other examples in the British Museum (N.H.), from Tasmania and Australia : Victoria, West Australia, with dates from December to February.

In *Bull. Mus. Comp. Zool.* Banks (1939) suggests rightly that the insect hitherto known as *Loticana opposita* (Walker) is really a *Symphitoneuria*. His description of both ♂ and ♀ of *Symphitoneuria wheeleri* clearly prove that his view is correct. In the British Museum (N.H.) there are several examples of

a dark-coloured *Symphitoneuria* in the male sex from Tasmania which, there can be little doubt, are the males of Walker's species. The neuration of the anterior wing in these examples agrees with that which I figured in the *Trans. R. ent. Soc. Lond.*, **85** : 118, as *Symphitoneuria exigua* McLachlan, from Melbourne. This description and figure were based on an example lent me by the Brussels Museum from a series determined as *S. exigua*. I now believe that this series really represents *opposita* Walker.

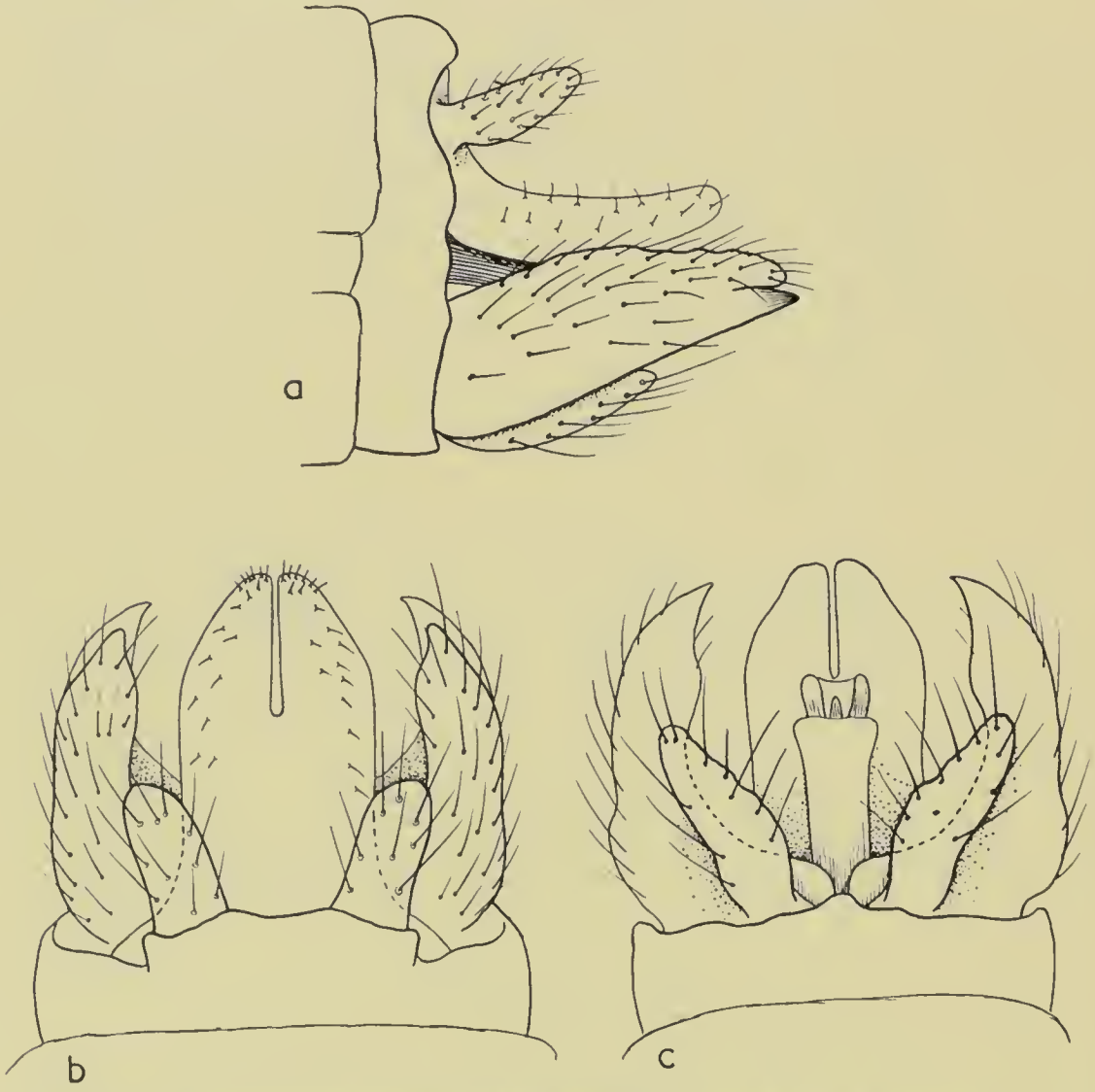

FIG. 187.—*Symphitoneuria wheeleri* Banks. ♂ genitalia. *a*, lateral; *b*, dorsal; *c*, ventral.

Symphitoneuria wheeleri Banks (figs. 186–188).

Symphitoneuria wheeleri, 1939, *Bull. Mus. Comp. Zool., Harv.*, **85** : 484, figs. 53, 70, 71.

In neuration *Symphitoneuria wheeleri* closely resembles *S. opposita*, the only appreciable difference lying in the length of fork no. 1 of the anterior

wing, which in the former species extends beyond the fold but, in the latter, does not reach it.

Genitalia, ♂.—From above, the margin of the ninth segment is produced at the centre in a wide, table-like structure with sinuous distal margin and slight angular projections; superior appendages short and broad. Upper penis-cover large with a very narrow excision or slit at the apex. Penis straight with cleft apex, contained in a sleeve with truncate distal margin,

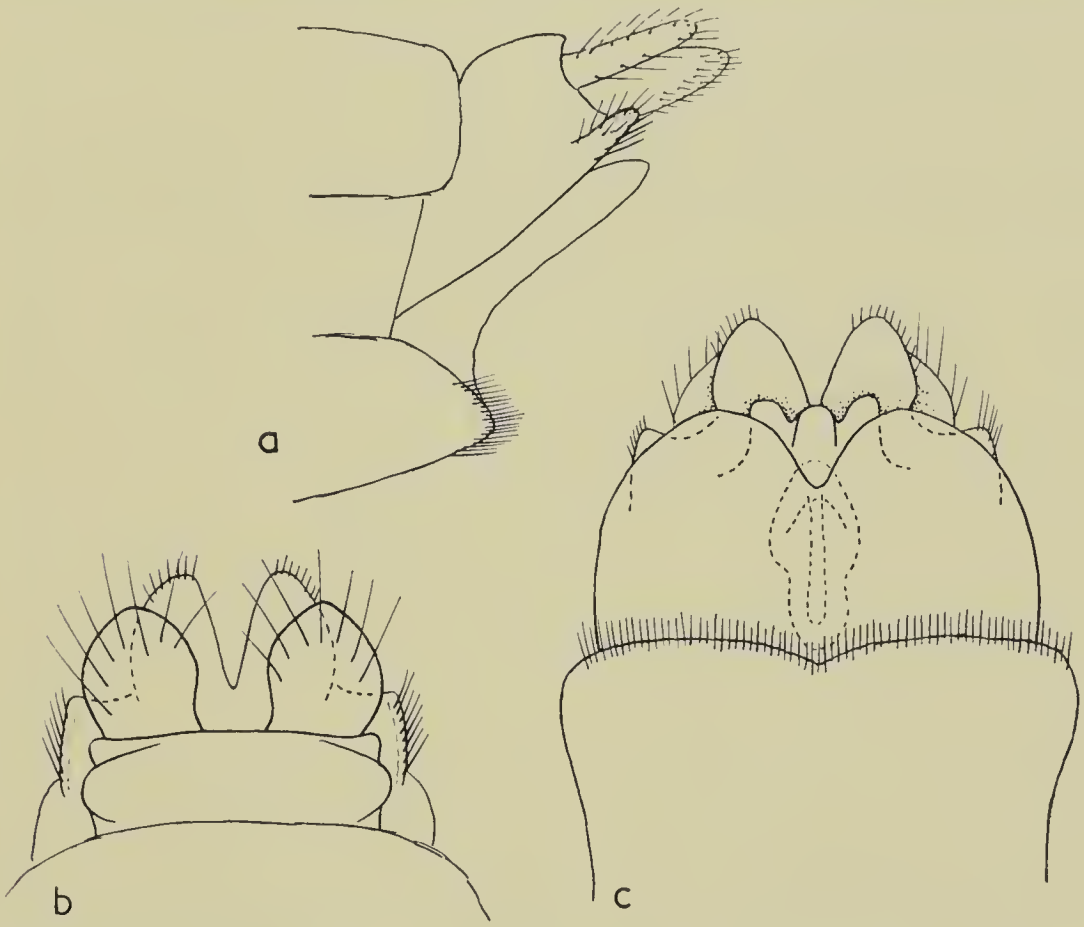

Fig. 188.—*Symphitoneuria wheeleri* Banks. ♀ genitalia. *a*, lateral; *b*, dorsal; *c*, ventral.

as seen from beneath, a small duct appearing in the excision of the penis. Inferior appendages three-branched; lower branches short and divergent, arising at the extreme base of the appendages; the median branch arises from a stout and long base and terminates in a chitinous claw; upper branch membranous, slightly shorter than the median, to which it is closely adpressed and separated from it only for a short distance from the apex.

Genitalia, ♀.—From above, the ninth segment terminates in a pair of broad, triangular plates beneath which may be seen a second pair which are slightly longer. From beneath, the eighth segment is strongly pigmented with the

distal angles slightly produced laterally and rounded; the ninth segment is transparent with a small excision at the centre of the distal margin.

Length of the anterior wing, ♂, 10·5 mm.; ♀, 11·5 mm.

W. Australia: Rottnest Isl., xi.1925, 1 ♂, 1 ♀, W. H. Mathews (C.S.I.R. Collection); Perth, 7.x.1886, from the McLachlan Collection; Yanchep, 13–23.xi.1935, 1 ♂, 2 ♀, R. E. Turner.

Type in the Museum of Comparative Zoology, Harvard, U.S.A. (Rottnest Isl.).

This description has been made from the ♂ and ♀ examples from the type locality in the collection of the C.S.I.R., Canberra.

Lectrides gen. n.

Spurs 2, 2, 4. *Wings*: anterior, fork no 1 slightly overlapping the discoidal cell, which is very long; media merging into the lower margin of the

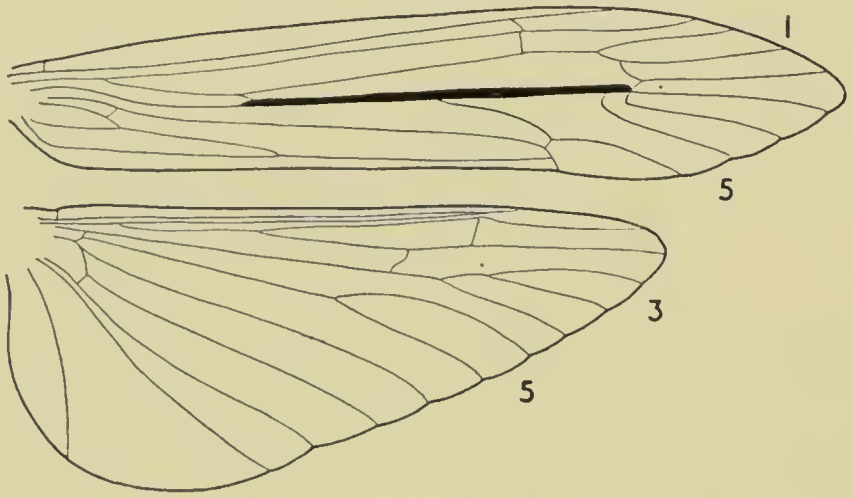

Fig. 189.—*Lectrides varians* gen. sp. n. ♂ wings.

discoidal cell, to make a long fold occupying the centre of the wing: fork no. 5 extending basally to about the middle of the discoidal cell. In the posterior wing discoidal cell long; fork no. 1 wanting; fork of the media does not reach the cross-vein below the discoidal cell. In the *genitalia* there are no third basal branches to the inferior appendages such as are found in the genitalia of most of the *Triplectides* group, to which *Lectrides* is closely allied.

Type species.—*Lectrides varians* sp. n.

This genus has considerable affinity with *Symphitoneuria* in the neuration of the anterior wing, from which it differs chiefly in the shorter fork no. 5. In the posterior wing the fork of the media does not reach the cross-vein below the discoidal cell. The genitalia diverge considerably from the *Symphitoneuria* pattern.

Lectrides varians sp. n. (figs. 189, 190).

Head dark ochraceous, completely denuded in the single example available. *Antennae* ochraceous with dark annulations. *Palpi* and *legs* covered with

short, white hair. *Wings* with short white and brown hairs to make an indistinct pattern, showing a dark patch in the costal area near the base and a pair of dark patches towards the apex. Other characters detailed in the generic description.

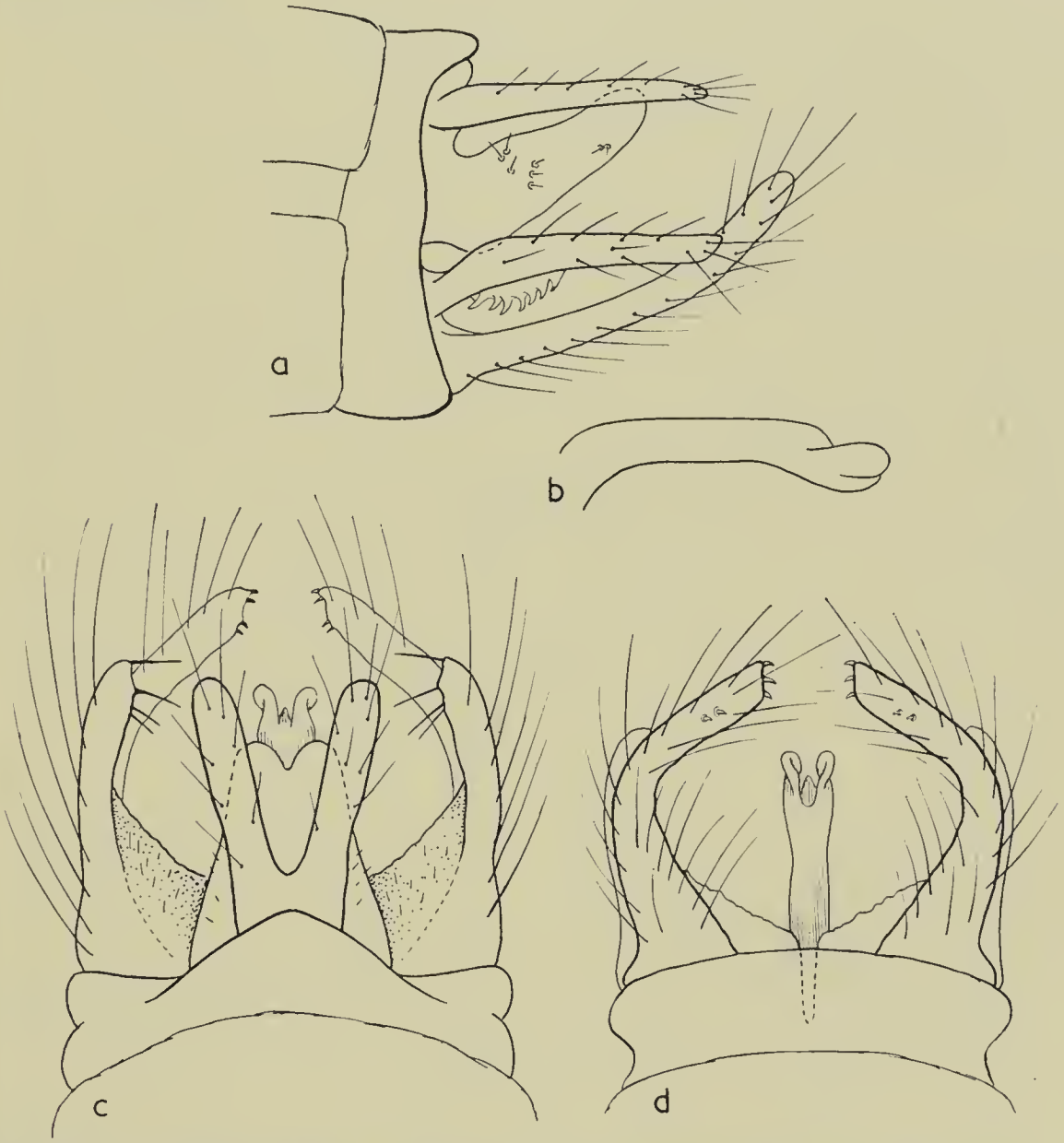

Fig. 190.—*Lectrides varians* gen. sp. n. ♂. *a*, genitalia, lateral; *b*, penis, lateral; *c*, genitalia, dorsal; *d*, ventral, superior appendages and upper penis-cover omitted.

Genitalia, ♂.—From above, distal margin of the ninth segment produced and triangular; centrally placed is a forked process, no doubt the superior appendages fused at the base, each fork fairly long, stick-shaped. Below is an upper penis-cover broad at its base, tapering to an excised apex and rather

shorter than the forked process ; from the side, the cover inclines upwards. Penis long, arched ; apex excised, with the head of the duct appearing in the excision. Inferior appendages with two branches, both arising from the base and more or less parallel, the lower the longer. The inner margin of the upper branch is extended in a broad, transparent plate whose margin is bent over slightly and armed with a series of claws. One or two thorn-like teeth on the inner margin of the lower branch at the apex.

Length of the anterior wing, ♂, 12·5 mm.

Tasmania : Sheffield, 8.i.1917, 1 ♂, R. J. Tillyard.

Subfam. **LEPTOCERINAE** Ulmer.

Ulmer, 1903, *Abh. Naturw. Ver. Hamb.*, **18** : 100.
Ulmer, 1907, *Gen. Insect.*, **60a** : 133.

Spurs 0, 2, 2 or 1, 2, 2 or 2, 2, 2 or 2, 2, 4. *Ocelli* absent. *Antennae* extremely slender, longer in male than female. Basal joint bulbose, rarely longer than head. *Maxillary palpi* very long and hairy ; all the joints comparatively long ; fourth and fifth usually thinner than the others ; fifth always flexible, apex of fourth also sometimes flexible. *Anterior wing* generally long and narrow, densely pubescent ; discoidal cell always closed. In the male, apical forks nos. 1 and 5 present in most genera. In *Athripsodes* and *Leptorussa* there is an additional apical fork in the anterior wing of the female, forks nos. 1, 3 and 5 being present. *Posterior wing* always shorter than anterior, sometimes broader, sometimes equal or narrower ; costal margin generally with a frenulum of short hooks ; discoidal cell open. Apical forks nos. 1 and 5, or only no. 1 present, no. 1 generally very small.

Key to Genera of Leptocerinae.

1. Venation differing in the sexes. Anterior wing with forks nos. 1 and 5 in male, 1, 3 and 5 in female. Spurs 2, 2, 4 . . . *Leptorussa* gen. n. (p. 272).
–. Venation alike in the sexes. Spurs 1, 2, 2 or 0, 2, 2 . . . . . 2.
2. Thyridial cell absent in anterior wing . . . *Triaenodes* McLachlan (p. 276).
–. Thyridial cell present in anterior wing . . . . . 3.
3. In anterior wing, M_{3+4} apparently arising from cross-vein *m-cu* or from Cu_{1a} *Oecetis* McLachlan (p. 281).
–. In anterior wing, M forks at anastomosis . . . *Leptocerus* Leach (p. 278). (*Setodes* Rambur *partim*).

Leptorussa gen. n.

Neuration as figured. There is an additional fork (apical fork no. 3) in the anterior wing of the female, as in the genus *Athripsodes*. *Maxillary palpi*, second joint longer than first, third about as long as second, fourth shorter than the first, fifth about as long as second. *Spurs* 2, 2, 4.

Type species.—*Leptorussa russata* sp. n.

The neuration of *Leptorussa* more or less agrees with that of the European genus *Athripsodes* (*Leptocerus* auctt. *nec* Leach), yet the narrower posterior wing, the pattern of the male genitalia and the different spur formula cause me to hesitate in extending the range of *Athripsodes* to the Antipodes.

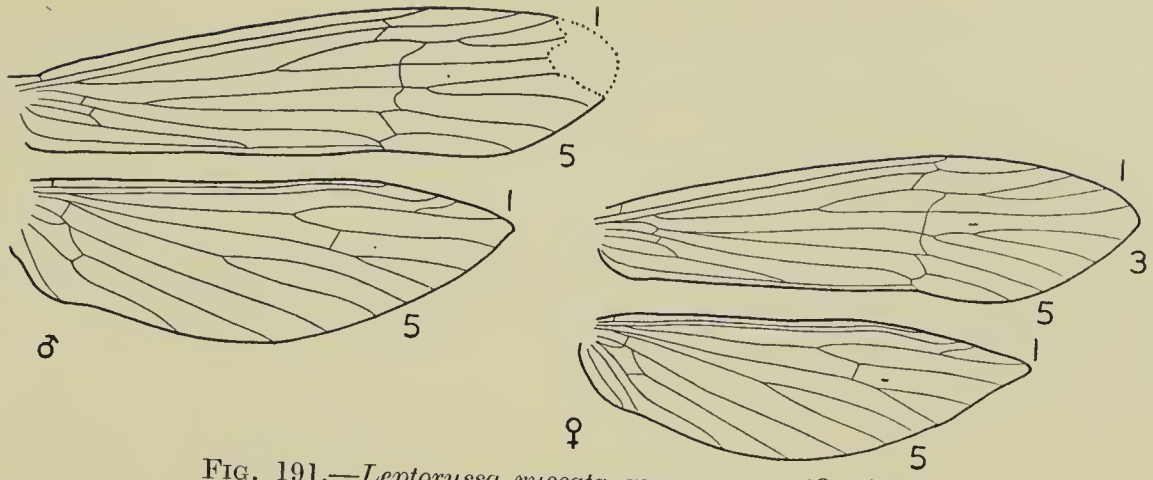

FIG. 191.—*Leptorussa russata* gen. sp. n. ♂♀ wings.

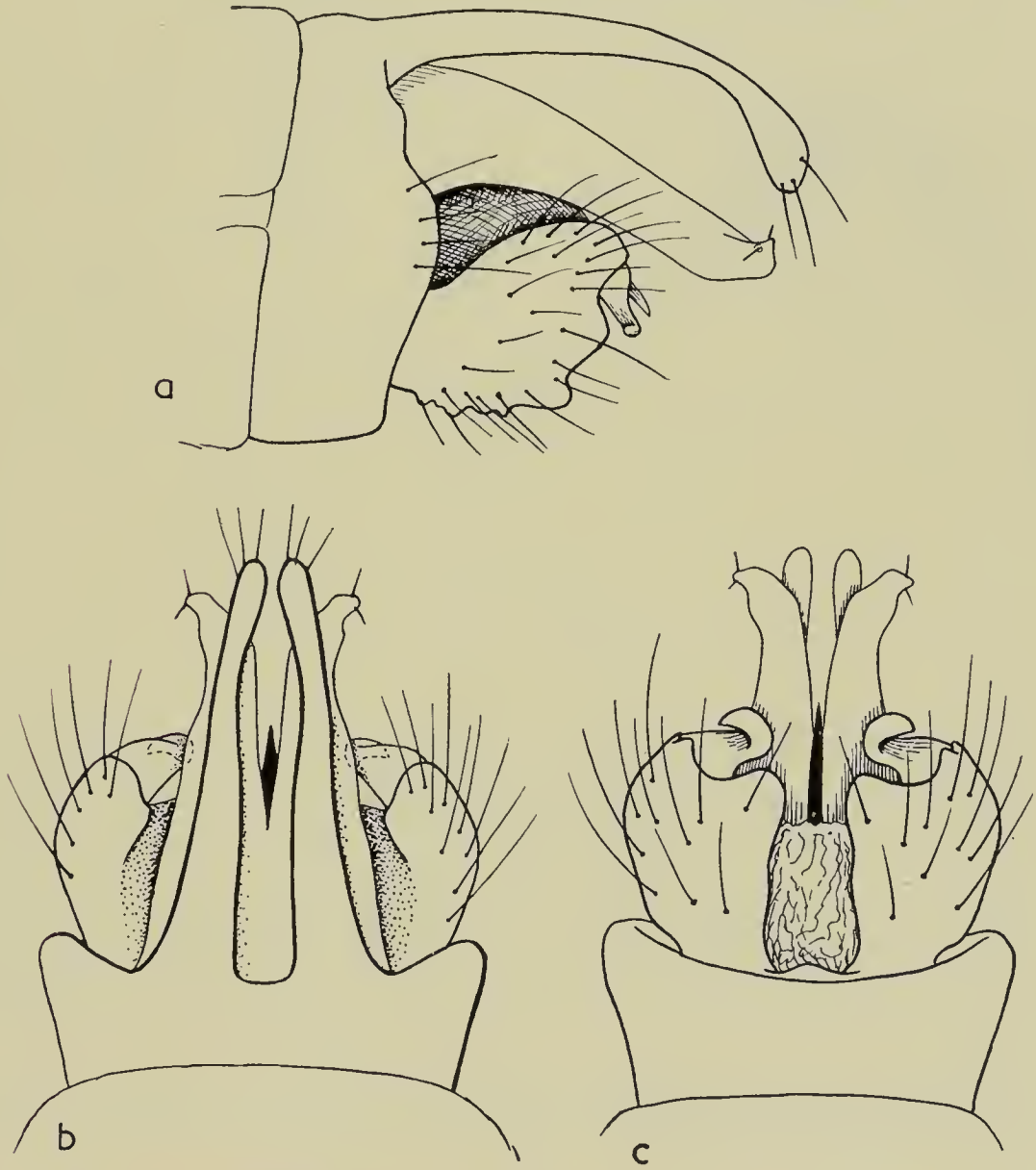

FIG. 192.—*Leptorussa russata* gen. sp. n. ♂ genitalia. *a.*, lateral; *b*, dorsal; *c*, ventral.

Banks has placed a South Australian species, *darlingtoni*, into *Leptocerus*, but he does not mention the spur formula, and his figure of the genitalia seems unlike anything in *Athripsodes*. The genitalia does somewhat resemble that of *Leptorussa russata*, and his species has therefore been transferred provisionally to this genus.

Leptorussa russata sp. n. (figs. 191–193).

Wings brown, posterior rather narrow : cross-vein closing the discoidal cell in the anterior wing angulate.

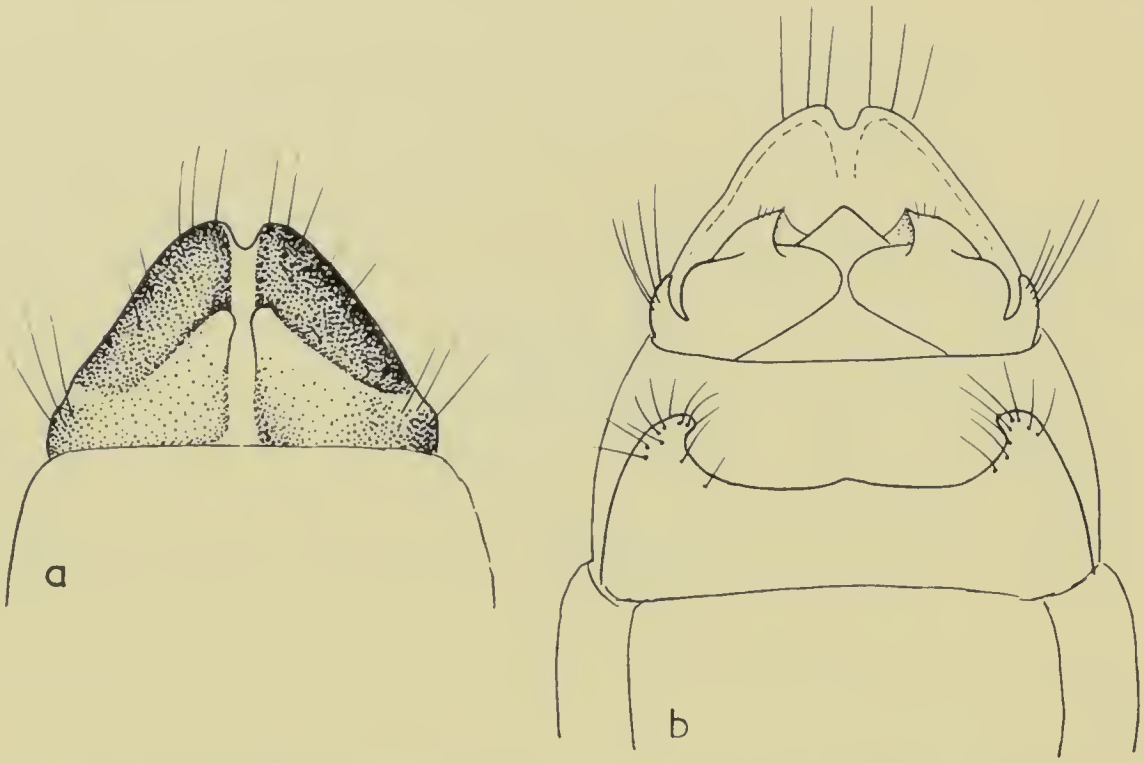

Fig. 193.—*Leptorussa russata* gen. sp. n. ♀ genitalia. *a*, dorsal ; *b*, ventral.

Genitalia, ♂.—From above, distal margin of the ninth segment produced in a pair of long processes extending to the full length of the upper penis-cover, and curving down towards it, apices clavate from the side ; these might be considered as a divided dorsal plate. Upper penis-cover consisting of a long, cleft, tapering process, wide at the base, the apex of each branch truncate, with the outer angle slightly produced. Penis appears as a short, sharp spine, arising from a mass of membrane. Inferior appendages two-jointed : basal joint very stout, from the side, distal margin truncate and undulating : terminal joint very short, with a corkscrew curl which leaves the apex directed outward.

Length of anterior wing, ♂ and ♀, about 8·5 mm.

Australia : Federal Capital Territory, Lee's Spring, xi.1932, 1 ♂ (*type*), R. J. Tillyard. New South Wales, Sydney, 17, 26.viii.1884, 3 ♂, 1 ♀, McLach-

lan Collection ; Stanwell Park, 26.x.1916, 1 ♂, R. J. Tillyard, South Australia, Mt. Lofty, x.1931, 1 ♂, J. W. Evans. Queensland, Stanthorpe, 9.ix, 7.x.1916, 1 ♂, 2 ♀, R. J. Tillyard.

Tasmania : Deloraine, 28.xii.1884, 1 ♂, McLachlan Collection ; Hobart, 6.xi.1916, 1 ♂, G. H. Hardy ; xii.1946, 2 ♀, J. W. Evans ; Orford, x.1938, 1 ♂, J. W. Evans.

Type, ♂ (from Lee's Spring), in balsam.

The female genitalia has been drawn from an uncleared example in alcohol.

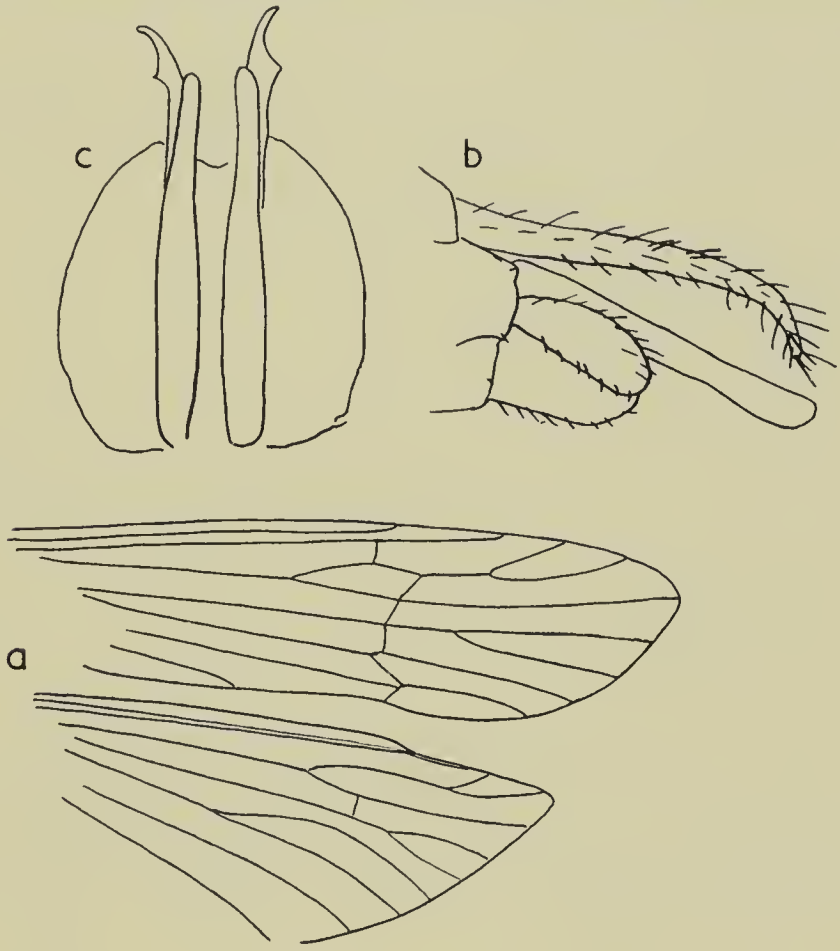

Fig. 194.—*Leptorussa darlingtoni* (Banks). ♂ (after Banks). *a*, wings ; *b*, genitalia, lateral ; *c*, dorsal.

Leptorussa (?) **darlingtoni** (Banks) (fig. 194).

Leptocerus darlingtoni Banks, 1939, *Bull. Mus. Comp. Zool. Harv.*, **85** : 487, figs. 48, 63.

Banks describes the species as follows :

" Head and thorax black, abdomen scarcely paler ; palpi dark brown, as also basal joint of antenna, beyond pale and narrowly annulate with dark ; head with some short white or yellowish hair and longer black hair ; legs brownish ; fore

wings nearly black, veins brown to black, with short black hair, a hyaline white mark over cross-vein from discal cell to medius ; hind wing paler, with black hair."

" Fore wings acute at extreme tip, shape and venation much as in *L. albifrons* ; discal cell with oblique end, fork one with rather long pedicel, fork three with a pedicel about one third of fork, fork five broad and oblique at base."

" In hind wings, which are plainly broader than the front pair, fork one is short, fork three is only a little longer, fork five long and tapering to a point at base."

" Male genitalia have above a pair of slender, parallel superior appendages, bent down near tip, and beneath a pair of outcurved reddish pieces ; large and much shorter pieces below."

" Fore wings 8·5 mm. long."

" From Aldgate Mt., Lofty Range, South Australia, 29 Nov. (Darlington)."

Type in the Museum of Comparative Zoology, Harvard College, U.S.A.

Triaenodes McLachlan.

Triaena McLachlan, 1865, *Ent. Ann.* : 34 (pre-occupied).
Triaenodes McLachlan, 1865, *Trans. ent. Soc. Lond.*, (3) 5 : 110.
Triaenodes McLachlan, 1877, *Rev. Syn. Trich.* : 319.
Triaenodes Ulmer, 1907, *Gen. Insect.*, 60a : 140.
Triaenodes Ross, 1944, *Ill. Nat. Hist. Surv. Bull.*, 23 : 244.

Spurs 1, 2, 2. *Antennae* long, basal joint stout, and as long as the head. *Maxillary palpi* very long and hairy. First and second joints broad, nearly equal in length ; third very long, fourth and fifth shorter and nearly equal. *Anterior wing* long and narrow, somewhat dilated towards the apex ; apical forks nos. 1 and 5 present : discoidal cell long, thyridial cell absent. In the *posterior wing* only apical fork no. 1 present.

Type species.—*Leptocerus bicolor* Curtis, 1834 (by subsequent designation of Ross, 1944).

Triaenodes volda sp. n. (fig. 195).

Insect cream-coloured with brownish streaks on the wings, particularly in the costal and apical areas. *Head* with white hair, very long on the basal joints of the antennae. Wings typically *Triaenodes* in neuration. *Maxillary palpi*, first, second and third joints long, about equal, fourth short, fifth rather longer than either of the first three.

Genitalia, ♂.—From above, the margin of the ninth segment membranous, and produced at its centre in a pair of long, strongly chitinized, downcurving spines. Beneath them is the penis, which is mainly membranous with a small, membranous branch arising from its upper surface from a narrow stem. There is an asymmetric, chitinous plate attached mainly beneath. Inferior appendage wide at the base, the outer angle produced in a large, incurving claw, the inner angle bearing a small, triangular projection. A slender branch arises from the upper surface of the base at about midway.

Length of the anterior wing, ♂, 7 mm.

Australia : Queensland, Eidsvold, 4.viii.1929, 5 ♂. W. Australia, Dongarra, 23.viii–5.ix.1935, R. E. Turner, 1 ♀.

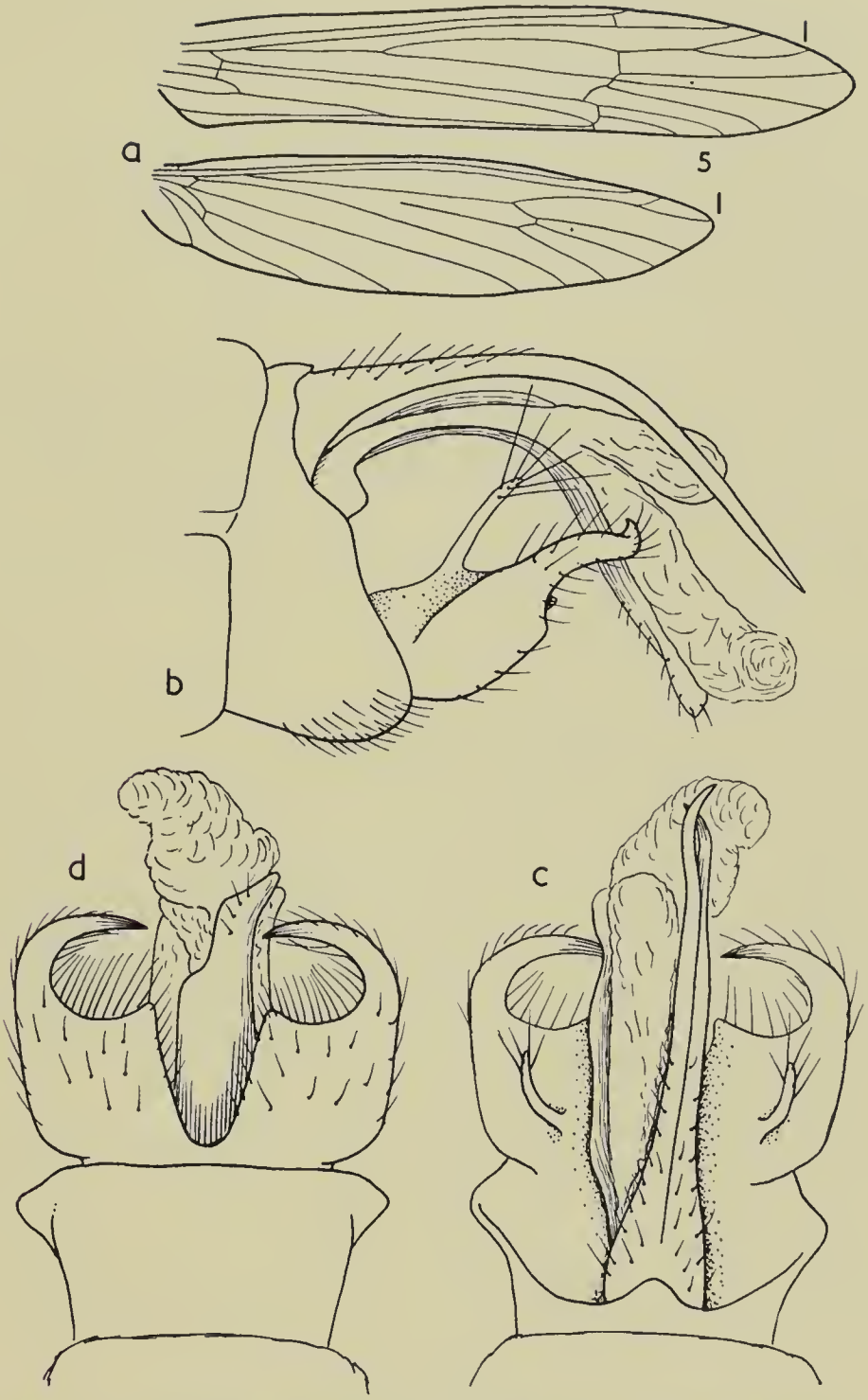

FIG. 195.—*Triaenodes volda* sp. n. ♂. *a*, wings; *b*, genitalia, lateral; *c*, dorsal; *d*, ventral.

Type, ♂ (Eidsvold), and paratypes, ♂, in the C.S.I.R. Collection, Canberra, paratypes, ♂♀, in the British Museum (N.H.). This species has a distinctive wing-pattern.

Leptocerus Leach.

Leptocerus Leach, 1815, in Brewster's *Edinburgh Encycl.*, **9** : 138.
Setodes Rambur, 1842, *Hist. nat. Ins. Nevr.* : 515 (*partim*).
Setodes McLachlan, 1877, *Rev. Syn. Trich.* : 338 (*partim*).
Setodes McLachlan, 1884, *1st Add. Suppl.* : 39–40 (group I).
Setodes Ulmer, 1907, *Gen. Insect.*, **60a** : 145 (*partim*).
Leptocerus Milne, 1934, *Stud. N. Amer. Trich.*, **1** : 18.
Leptocerus Kimmins, 1949, *Entomologist*, **82** : 201.

Spurs 0, 2, 2. *Antennae* always much longer than wings. *Anterior* wing long and narrow, lanceolate, not dilated ; apex acute ; discoidal cell comparatively short ; media forked at anastomosis ; thyridial cell extremely long and narrow. Apical forks nos. 1 and 5 present, no. 1 with a footstalk ; anastomosis irregular. *Posterior wing* even narrower than anterior, always acute. Apical forks nos. 1 and 5 present. Stem of Rs complete basally.

Type species.—*Phryganea interrupta* Fabricius, 1775 (only included species).

Leptocerus souta sp. n. (fig. 196).

Insect dark amber. *Wings* covered with short, creamy hair mixed with brownish. Neuration as figured.

Genitalia, ♂.—From above, there is a large bifurcate plate, each fork acute at the apex and bearing long hairs, a wide excision between them. From the underside of each fork arises a long, distally directed process, tapering to an acute apex armed with a pair of long bristles, forming what is no doubt an upper penis-cover. Penis strongly arched ; apex consisting of a sinuous, strongly chitinized spine ; from above it is trident-like, with the centre prong stronger than the outer prongs, which are very acute and transparent, and slightly shorter than the centre. Inferior appendages very large, bifurcate ; upper branch with a huge, elavate apex and rather longer than the lower. Side-pieces of the ninth segment produced in slender spines.

Length of anterior wing, ♂, 8·5 mm.

AUSTRALIA : S. Australia, 1 ♂ (*type*), McLachlan Collection ; Queensland, Brisbane, 15.xi.1913, 2 ♂, Tillyard Collection.

Type, ♂, mounted in balsam.

This species differs from *L. assimulans* (Ulmer) in its colour and the very different form of the ♂ genitalia.

Leptocerus assimulans (Ulmer) (fig. 197).

Setodes assimulans Ulmer, 1916, *Ark. f. Zool.*, **10** : 20–21, figs. 25–26.

This species is not known to me, and below is given a free translation of Ulmer's description :

This species belongs to the *Setodes* group with an additional apical sector

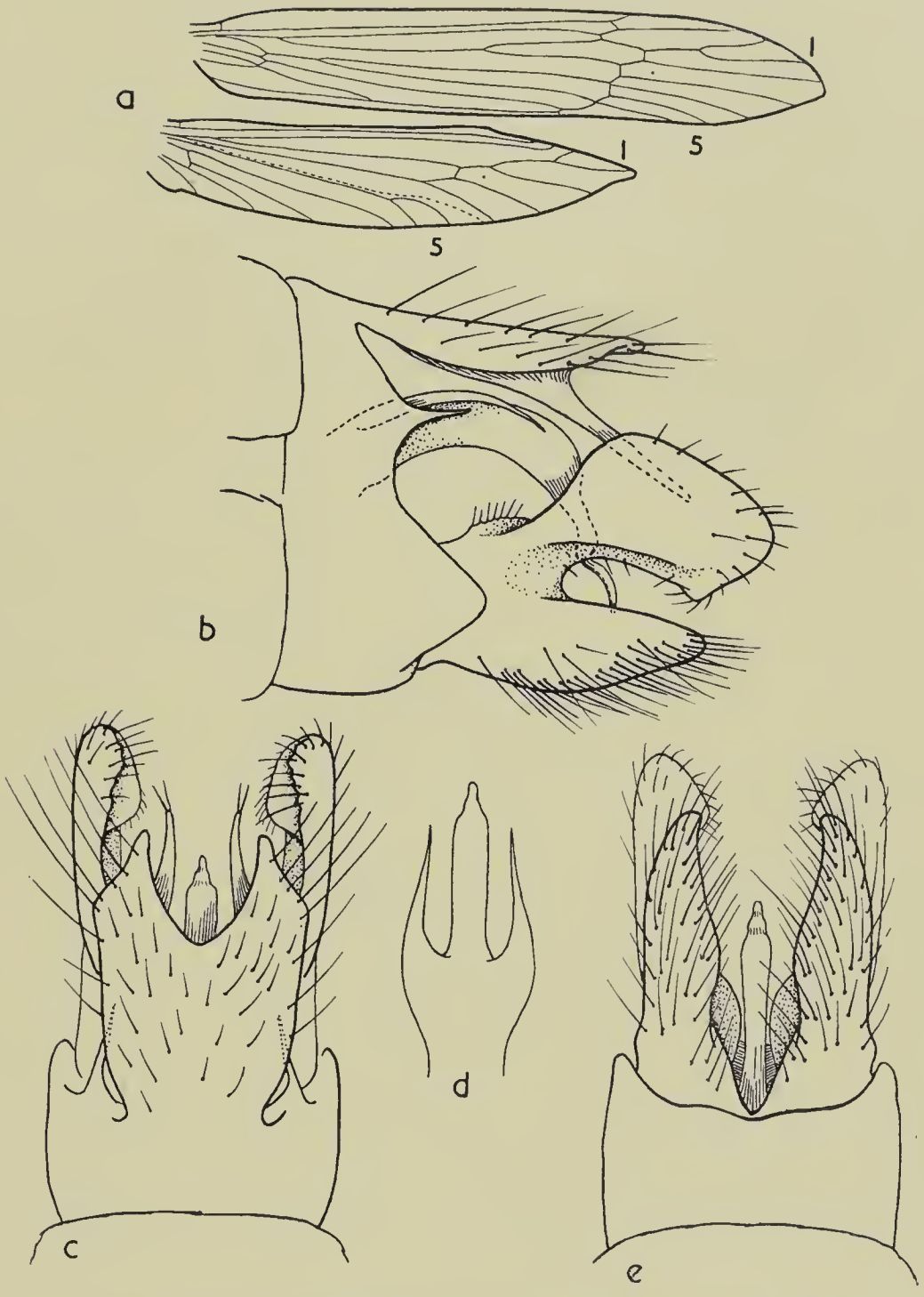

FIG. 196.—*Leptocerus souta* sp. n. ♂. *a*, wings ; *b*, genitalia, lateral ; *c*, dorsal ; *d*, ventral.

above fork no. 5 in the posterior wing: the material is preserved in spirit; in its dark colour the new species resembles *Setodes interrupta* Fabr., although lacking the white markings of the latter (at least in spirit material); the genitalia differ widely.

Head and *thorax* shining, with black hairs. *Abdomen* blackish-brown above, red-brown below. *Antennae* broken. *Palpi* and *legs* dark brown; coxae darker. *Wings* very long and narrow, pointed; membrane dark grey-brown,

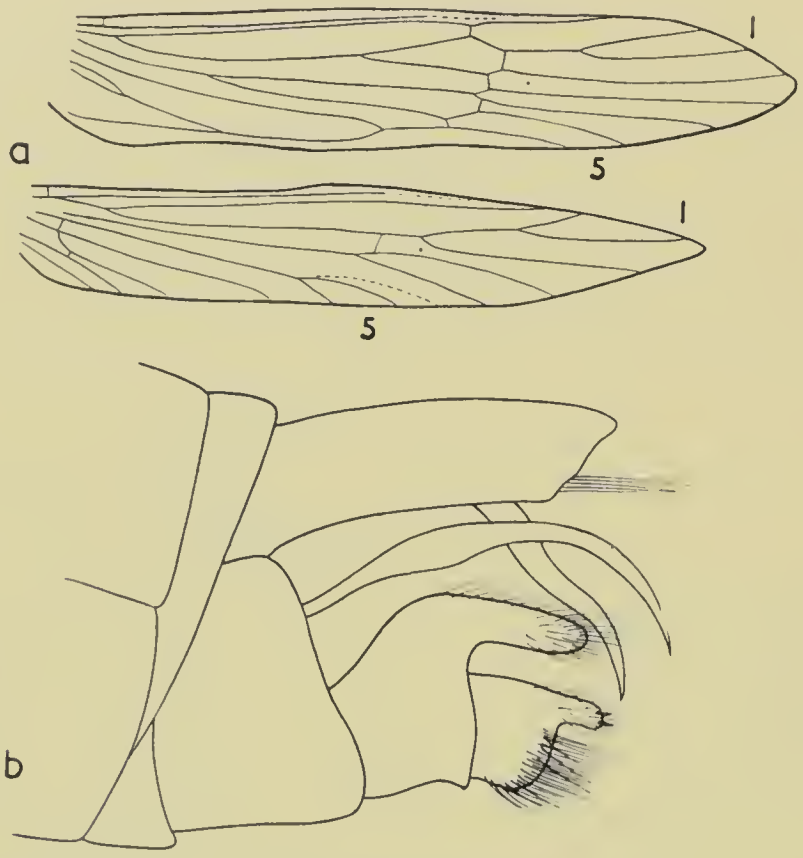

FIG. 197.—*Leptocerus assimulans* (Ulmer). ♂ (after Ulmer). *a*, wings; *b*, genitalia, lateral.

with dense black pubescence, so that the veins, which are paler than the membrane, cannot be seen without removal of the pubescence; wing-fringes grey-black. Discoidal cell of anterior wing moderately broad, its upper margin distinctly angled at the cross-vein, the radius also strongly curved toward the same cross-vein; fourth apical cell sessile. In the posterior wing, apical fork no. 1 very long, fourth apical cell also sessile; above fork no. 5 a furrow or "additional apical vein." The male *genitalia* are complicated in structure. In side-view one sees a large arched plate, centre of its apical margin somewhat projecting, above the other appendages (there is only a single plate present, not two, so that one must consider it to be an undivided tenth tergite. From the lateral margin of this plate descends a somewhat

sinuously bent spine, reaching to between the inferior appendages. Above the inferior appendages lie two longer spines, curving upwards and inwards, their apices crossing. Inferior appendages are very strong and broad, two-jointed. The terminal joint reproduces in miniature the form of the basal joint ; the latter forms a strongly excavated plate, its dorsal margin produced in a straight, tailwardly-directed branch. The branch of the terminal joint bears two or three spines at its apex, and its broad base a large number of stiff black bristles. The appendages are set close together on the ventral margin.

Body length, about $3\frac{1}{2}$ mm. ; length of fore wing, nearly 5 mm. ; expanse about $10–10\frac{1}{2}$ mm.

2 ♂, Cedar Creek, Queensland, Mjöberg.

Types in the Stockholm Museum.

Oecetis McLachlan.

Oecetis McLachlan, 1877, *Rev. Syn. Trich.* : 329–330.
Oecetina Banks, 1899, *Trans. Am. ent. Soc.*, **25** : 215.
Setodes Hudson, 1904, *N. Zeal. Neur.* : 78.
Oecetis Ulmer, 1907, *Gen. Insect.*, **60a** : 142.
Oecetodes Ulmer, 1907, l.c. : 144.
Setodina Banks, 1907, *Proc. ent. Soc. Wash.*, **8** : 129.
Friga Milne, 1934, *Studies N. Amer. Trich.*, **1** : 16.
Quaria Milne, 1934, l.c. : 17.
Yrula Milne, 1934, l.c. : 17.
Potamoryza Barnard, 1934, *Trans. R. Soc. S. Afr.*, **21**, 352 (**syn. nov.**).
Oecetis Ross, 1944, *Illinois Nat. Hist. Surv. Bull.*, **23** : 236.

Spurs 0, 2, 2 or 1, 2, 2. *Antennae* more than twice the length of the wings, generally pale, without apparent annulations ; basal joint as long as, or rather longer than the head. *Anterior wing* ordinarily very long and narrow. Sc connected to R_1 near the apex by a thickened cross-vein, R_1 also thickened apically. Apical forks nos. 1 and 5 present. Discoidal cell often very long ; thyridial cell long and narrow. Media apparently unforked, M_{3-4} arising from the cross-vein between M and Cu, or even fused with Cu_{1a} for some distance. Posterior wings sometimes broader than anterior ; apical forks nos. 1 and 5 present.

Type species.—*Leptocerus ochraceus* Curtis, 1825 (by subsequent designation of Ross, 1944).

Key to Species of *Occetis*.

1. Anterior wing, apical fork no. 1 with a footstalk ; male without patch of specialized hair-scales . . . . . 2.
–. Anterior wing, apical fork no. 1 sessile ; male sometimes with patch of specialized hair-scales in centre of wing . . . . . 11.
2. Male, upper penis-cover forming a single finger-like process ; spurs 0, 2, 2 . 3.
–. Male, upper penis-cover bifid or absent ; spurs 1, 2, 2 . . . . 4.
3. Male, upper penis-cover twice as long as superior appendages . *O. asmanista* sp. n. (p. 282).
–. Male, upper penis-cover only slightly longer than superior appendages *O. minasata* sp. n. (p. 282).

4. Male, inferior appendages with four branches, penis-sheaths present *O. complexa* sp. n. (p. 284).
–. Male, inferior appendages not so formed . . . . . 5.
5. Male, inferior appendages from beneath quadrate, outer apical angle produced to form a strong, incurved hook or claw . . . . . 6.
–. Male, inferior appendages not so formed . . . . . 7.
6. Male, superior appendages from side slender, acute *O. aeoloptera* sp. n. (p. 287).
–. Male, superior appendages short and rounded . . *O. atarpa* sp. n. (p. 287).
7. Male, superior appendages large, about half as long as inferiors *O. arcada* sp. n. (p. 290).
–. Male, superior appendages small, much less than half as long as inferiors . 8.
8. Male, inferior appendage with slender, finger-like branch arising from upper surface at base . . . . . *O. parka* sp. n. (p. 290).
–. Male, inferior appendage not so formed . . . . . 9.
9 Male, inferior appendages from side evenly tapering from base to apex *O. multipunctata* Ulmer (p. 293).
–. Male, inferior appendages from side with wide rounded excision on upper margin about midway . . . . . 10.
10. Male, inferior appendages from beneath rather long and slender *O. inscripta* sp. n. (p. 294).
—. Male, inferior appendages from beneath stout . . *O. laustra* sp. n. (p. 295).
11. Anterior wings pale ochraceous, without markings . . *O. lurida* sp. n. (p. 298).
—. Anterior wings brownish, with darker markings . . . . . 12.
12. New Zealand species . . . . . *O. unicolor* (McLachlan) (p. 299).
—. Australian species . . . . . 13.
13. W. Australia, Queensland . . . . . *O. pechana* sp. n. (p. 302).
—. Victoria . . . . . *O. australis* (Banks) (p. 305).

Oecetis minasata sp. n. (fig. 198).

Insect collected in fluid, yellowish. *Spurs* 0, 2, 2.

Genitalia, ♂.—From above, centre of the distal margin of the ninth segment produced in a blunt triangle with a very truncate apex; beneath this is a pair of rather swollen, short, blunt superior appendages with a short, transparent upper penis-cover between them, apex slightly dilated. Penis, directed downward in a widening trough, arises from a swollen base. Inferior appendages from the side, broad at the base, narrowing towards the apex to leave a distinct angle on the distal margin. The apices are turned inward and downward in large hooks; markings on the third, fourth, fifth, sixth and seventh tergites as in *Oecetis asmanista*.

In the figure the inferior appendages are somewhat extruded to show the membranous attachment.

Length of the anterior wing, ♂, 8 mm.

Tasmania: 3 ♂, J. W. Evans.

Type, ♂, in balsam.

O. minasata may be separated from *O. asmanista* by the shorter upper penis-cover.

Oecetis asmanista sp. n. (fig. 199).

Insect collected in fluid, yellowish. *Spurs* 0, 2, 2.

Genitalia, ♂.—From the centre of the distal margin of the ninth segment

arise two small processes, apices rounded ; beneath them is a pair of blunt, rather short, superior appendages, and a single long process between them is, no doubt, the upper penis-cover. Penis short, arising from a very humped base and forming a blunt, downturned trough. Inferior appendages broad-based, apical portions narrower and terminating in clavate apices when seen from behind, truncate from beneath, inner surfaces furnished with strong teeth. Third, fourth, fifth, sixth and seventh tergites bear a pattern formed

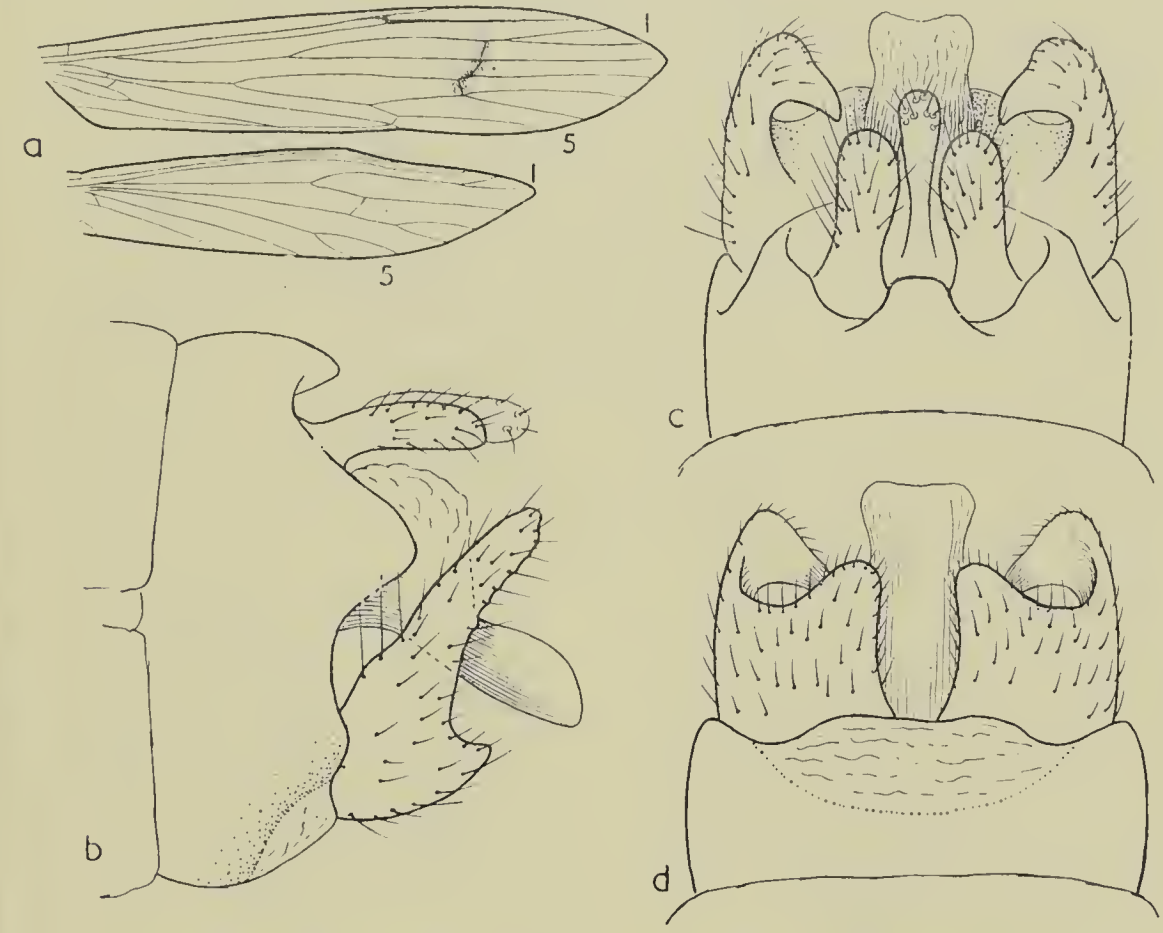

Fig. 198.—*Oecetis minasata* sp. n. ♂. *a*, wings ; *b*, genitalia, lateral ; *c*, dorsal ; *d*, ventral.

by pairs of lozenge-shaped discs, transparent in the centre and surrounded by brownish pigmentation.

Length of the anterior wing, ♂, 8·5 mm.

Tasmania : 1 ♂, J. W. Evans.

Type, ♂, mounted in balsam.

This species and *O. minasata* may be distinguished from other Australian *Oecetis* spp. by the spur-formula and the finger-like upper penis-cover, which is long in *asmanista* and much shorter in *minasata*.

Oecetis complexa sp. n. (Kimmins) (fig. 200).

♂. *Head* fulvous, with ochraceous pubescence. *Antennae* ochraceous, not annulated. *Palpi* fulvous, with ochraceous pubescence. *Legs* ochraceous. *Spurs* 1, 2, 2. *Anterior wing* with dense ochraceous and brown pubescence, the brown hairs arranged to form spots over the forks, cross-veins and vein endings. Marginal fringe fulvous, fuscous beyond the arculus.

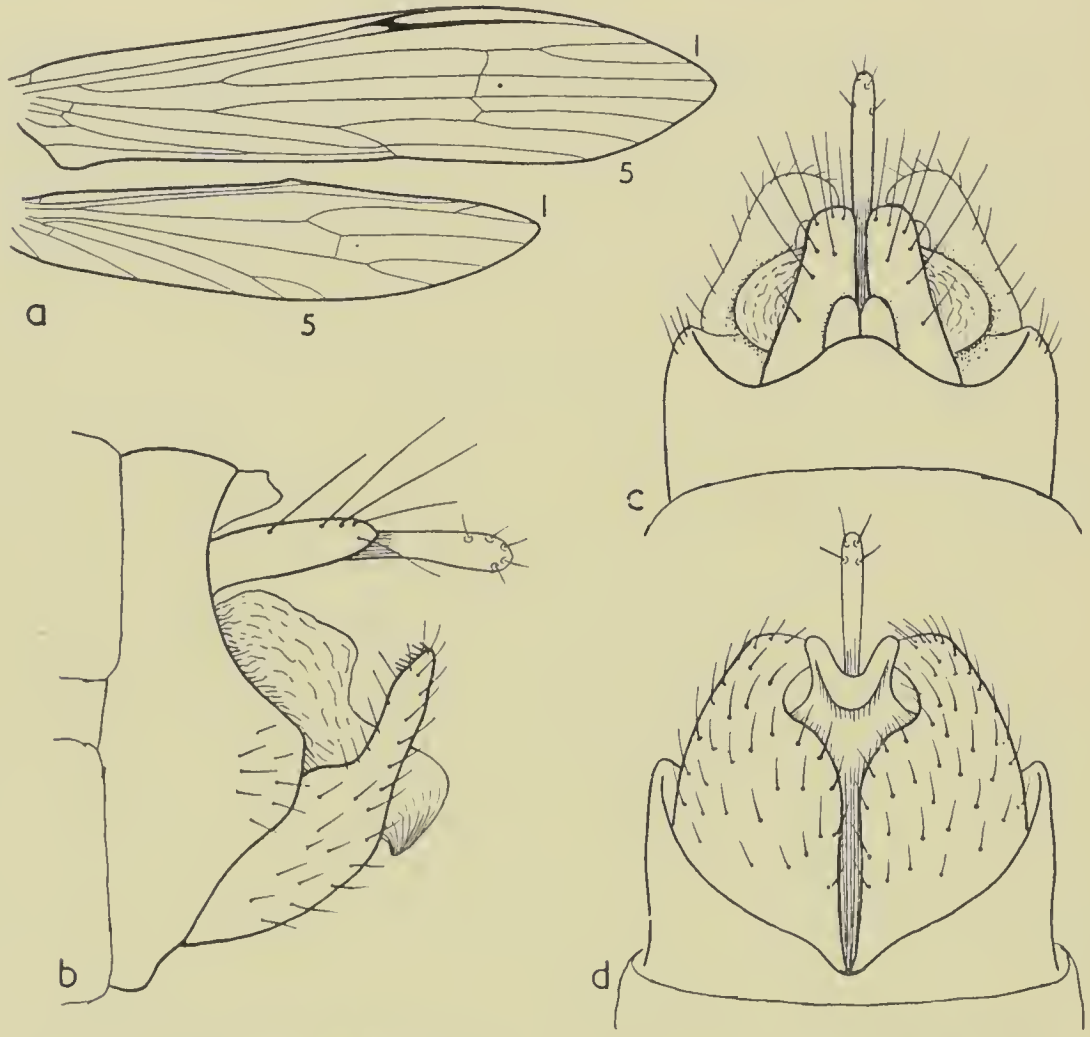

FIG. 199.—*Oecetis asmanista* sp. n. ♂. *a*, wings; *b*, genitalia, lateral; *c*, dorsal; *d*, ventral.

Genitalia.—Ninth segment from the side with a deep excavation of the margin in the upper half. From above, the apical margin is produced in a long process terminating in two slender, divergent lobes, which from the side are bent downwards and adpressed to the penis and sheaths. Towards the base of this process are two elongate, hairy warts, and basally from them is a small circular aperture. It is probable that these warts and the bifid process represent superior appendages and upper penis-cover, welded to the ninth

FIG. 200.—*Oecetis complexa* sp. n. ♂. *a*, wings ; *b*, genitalia, lateral ; *c*, dorsal ; *d*, ventral.

segment. Penis-sheaths broad at their bases, arched, each tapering in the apical third to a divergent, spine-like apex, and with a small tooth on the lower surface. Penis also arched, stout from the side, with a shallow con-

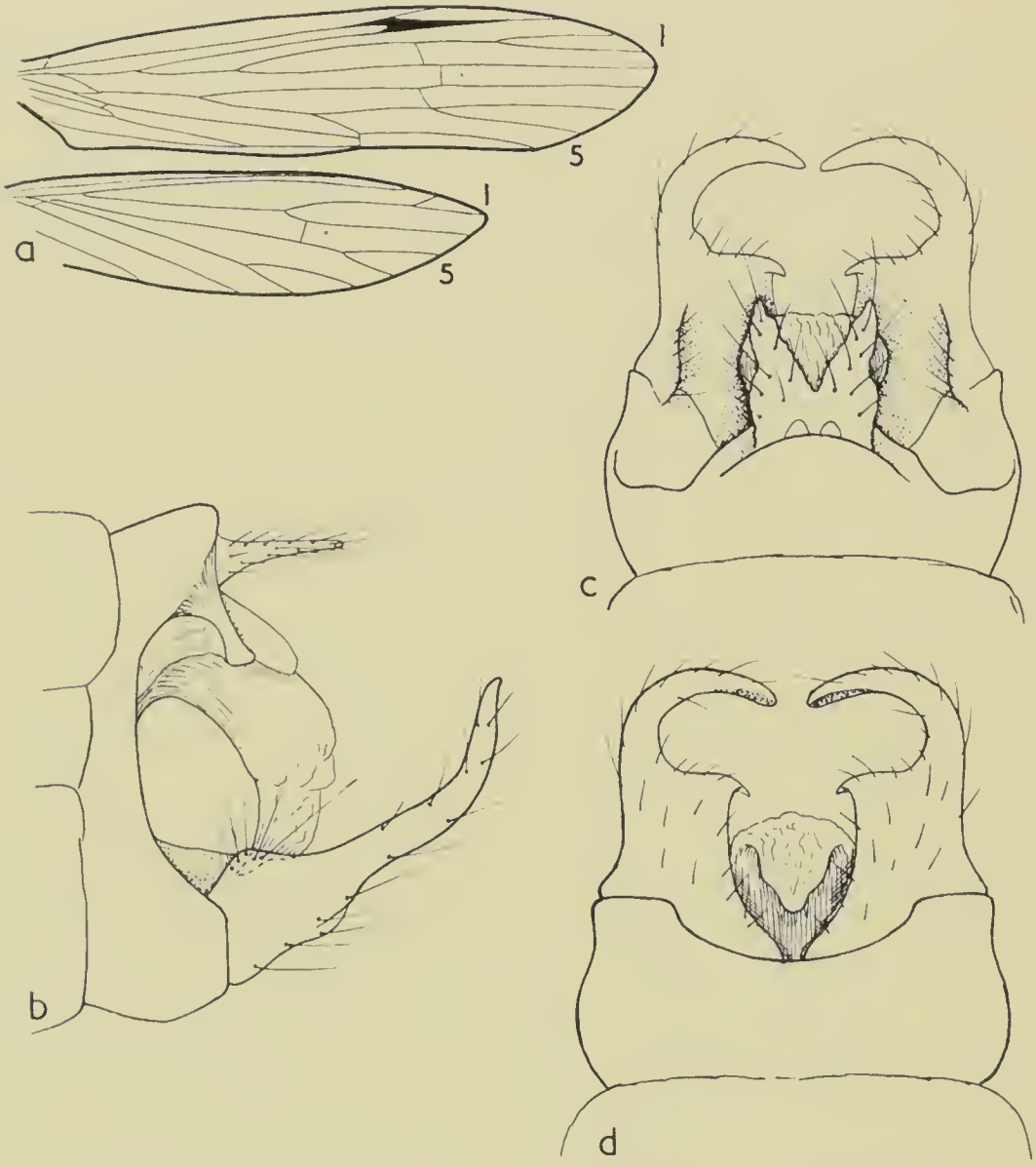

FIG. 201.—*Oecetis aeoloptera* sp. n. ♂. *a*, wings ; *b*, genitalia, lateral ; *c*, dorsal ; *d*, ventral.

striction on the upper surface before the apex, which is obliquely truncate. On each side, towards the base, is a small, acute spine. Inferior appendage with a stout basal part, from which arise four branches. The main branch is slender, calliper-shaped, about as long as the basal part. Below it, at its base, the margin is produced in a short, foliate branch. Above it, the upper margin

is produced in the third and fourth branches, of which the inner is the larger, with an elongate, clavate apex. Ventral margin of ninth segment excavated.

Length of anterior wing, 7 mm.

AUSTRALIA: New South Wales, Murwillumbah, 9.ix.1913, 1 ♂, R. J. Tillyard.

Type, ♂, in form of microscope preparations.

In venation and wing markings this species resembles *O. multipunctata* Ulmer but in the anterior wing fork no. 5 extends only to about the middle of the thyridial cell, and in the posterior wing the fourth apical cell is a little longer.

Oecetis aeoloptera sp. n. (Kimmins) (fig. 201).

♂. *Head* and pubescence fulvous, *antennae* fulvous, not annulated. *Palpi* fuscous, with fulvous hairs. *Thorax* brownish, *legs* fulvous. *Spurs* 1, 2, 2. *Anterior wing* mottled with brown and yellowish pubescence, and with the customary brown spots on the wing forks. *Posterior wing* with brown pubescence, chiefly on the veins. Anterior wing, fork no. 1 a little longer than its footstalk; third apical cell does not reach the discoidal cell. M_{3+4} confluent with Cu_{1a} for a very short distance; fork no. 5 reaches middle of thyridial cell.

Genitalia.—Ninth segment short, from the side with a wide excision of the lateral margin. Dorsal margin produced at its centre and carrying a pair of superior appendages, more or less welded to it and to each other at the base, so that from above they appear as a bifurcate plate, each fork narrow and with finely serrate margins. On each side of these superior appendages the margin of the ninth segment is produced downwards and inwards in a finger-like process, clavate at its apex, appearing to act as a support to the upper penis-cover, which is small, transparent, with an excised apical margin, only visible from behind. Penis short, arching downward, with an acute lip at the apex. Inferior appendages from beneath forficulate, the hook-like apex arising from the outer angle of a quadrate base, the inner apical angle forming a short upcurved hook. From the side the appendage curves upward. Ninth ventral segment broadly excised at the centre of its apical margin.

Length of anterior wing, 7 mm.

AUSTRALIA: New South Wales, Murwillumbah, 9.ix.1913, 1 ♂, R. J. Tillyard.

Type, ♂, with abdomen mounted in balsam.

In this example the cross-vein between Rs and M in the right hind wing is aberrantly absent. The form of the inferior appendages gives a good character with which to separate this species from most other Australian *Oecetis* spp., except *O. atarpa*, from which it differs in the more slender superior appendages.

Oecetis atarpa sp. n. (figs. 202–203).

Head and *thorax* ochraceous, clothed with white hair. *Antennae* ochraceous with no apparent annulations. *Palpi* and *legs* dark ochraceous; *abdomen* green. *Spurs* 1, 2, 2. *Anterior wings* light fulvous with short, white hairs

amongst which are fulvous hairs arranged in streaks and patches to make about six elongate spots towards the base. A broad patch extending obliquely from the costa across the distal margin of the discoidal cell, diminishing towards the fifth apical cellule and numerous spots round the distal margin of the wing. Anterior wing with a long footstalk to fork no. 1.

FIG. 202.—*Oecetis atarpa* sp. n. ♂ paratype. *a*, genitalia, lateral; *b*, dorsal; *c*, ventral.

[*Genitalia*, ♂. In general pattern resembling *O. aeoloptera* Kimmins. The superior appendages are short, rounded, more widely separated and scarcely fused at their bases. The upper penis-cover projects beyond the superior appendages, its apical margin bilobed from above. The rib supporting the upper penis-cover is not clavate at its apex, and on each side the margin of the ninth segment is produced in a small pointed side-piece. Penis similar to

aeoloptera. Inferior appendages from the side with the base more dilated, and the apex a little stouter. From beneath, the outer finger is less hooked and the inner apical angle less acute.—D. E. K.]

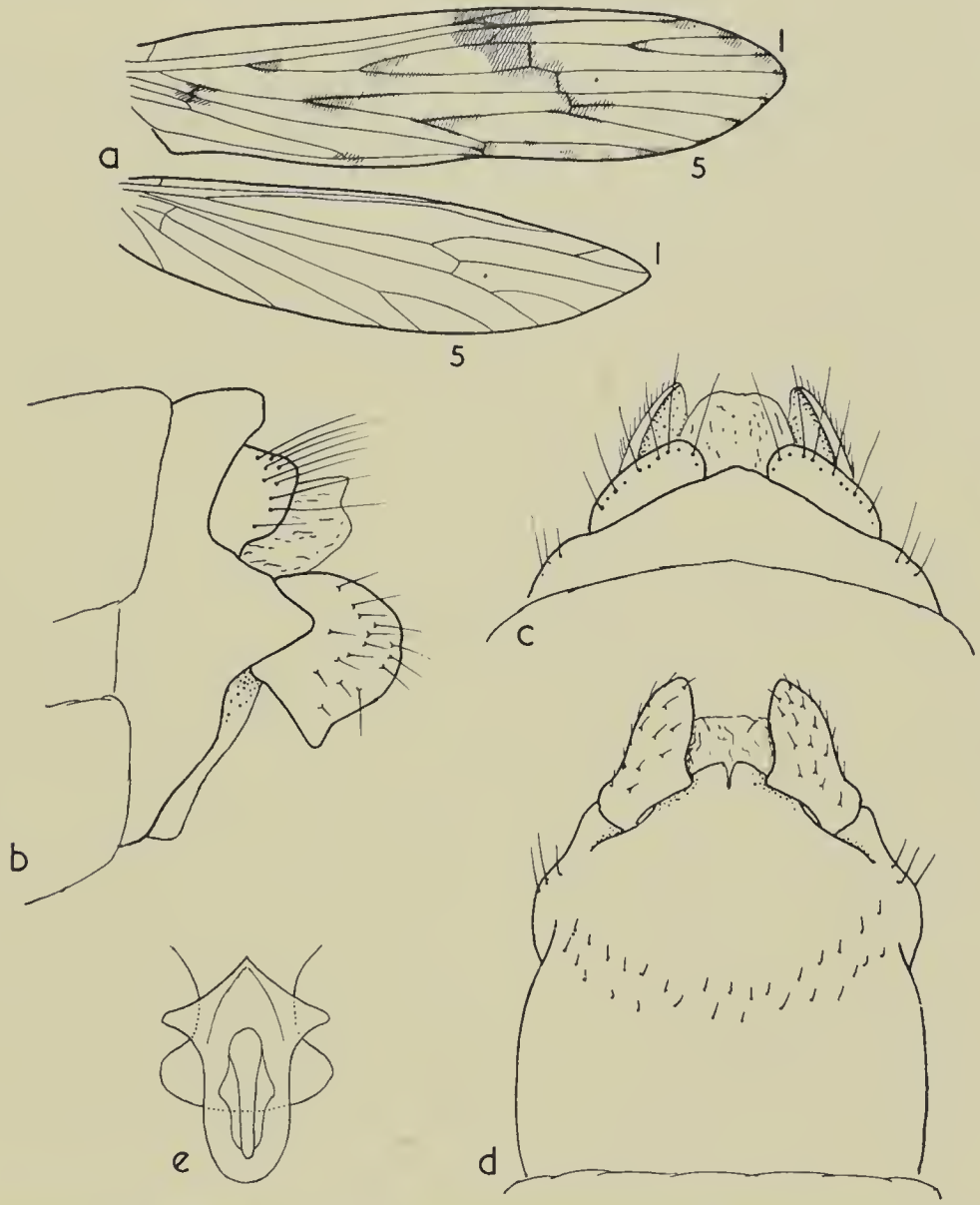

FIG. 203.—*Oecetis atarpa* sp. n. ♀ type. *a*, wings; *b*, genitalia, lateral; *c*, dorsal; *d*, ventral; *e*, vaginal structure, ventral.

Genitalia, ♀.—From above, terminal dorsal segment produced and triangular. On each side of the apex is a wide, oval plate. Beneath this is the ovipositor, rather short and wide at the base. From the side, towards the base of the ovipositor, one on each side, is a pair of rounded plates with a small, acute and slightly inturned projection of the lower margin. The terminal

ventral segment is elongate and triangular with excised apex ; along the median line of the tergites is a series of short, elongate marks.

Length of the anterior wing, ♀, 7 mm.

Australia : N. S. Wales, National Park, 27.xi.1915, 1♀ (*type*), 14.xii.1915, 1♂, bred R. J. Tillyard.

[Mr. Mosely departed from his usual custom of not describing new species from female examples in this instance as he felt sure that the distinctive markings of the wings and the form of the genitalia should render the insect easily distinguishable. Since his death a male has been discovered in the Museum accessions which agrees well in markings and venation, and descriptions and figures of the genitalia of this sex have been added. Although he would certainly have made this male the type, had he seen it, I did not feel justified in changing the type of his species, and the male has therefore been selected as paratype. Strictly it should be an allotype, but Mr. Mosely recognized only types and paratypes, and for the sake of uniformity this course has been adopted here. The ♂ differs from *O. aeoloptera* in the form of the superior appendages.—D. E. K.]

Oecetis arcada sp. n. (fig. 204).

Head, body, legs and *palpi* dark ochraceous. *Antennae* ochraceous without annulations. *Spurs* 1, 2, 2. *Anterior wing* light fuscous, clothed with golden and brown hair, the latter forming various patches, of which the most conspicuous are one about midway along the costal margin, another extending downwards towards the apex of the wing, and various smaller ones in the neighbourhood of the apex and fork no. 5. Fork no. 1 with a long footstalk.

Genitalia, ♂.—From above, distal margin of the ninth segment irregular, with a pair of minute, membranous processes arising at the centre. Superior appendages moderately short, spindle-shaped, centrally placed, one on each side of the central processes. Side-pieces of the ninth segment very unusual ; they are strongly produced, with acute apices and turned inwards towards each other across the cavity of the genitalia. Penis short, thick, bent downward at right angles at about its centre. Inferior appendages stout, shortish : apices truncate from the side : inner surfaces concave with an excision of the inner margin towards the apex as seen dorsally and ventrally. Distal margin of the 9th segment widely concave. There is an aberrant process to the sixth tergite in the type, in form of a small, spatulate finger set on one side of the central line.

Length of the anterior wing, ♂, 7 mm.

Tasmania : Cradle Mts., 16.i.1917, 1 ♂ (*type*), R. J. Tillyard.

The large superior and stout inferior appendages afford characters to separate this species from other Australian *Oecetis* spp.

Oecetis parka sp. n. (fig. 205).

The *type* is in poor condition and considerably denuded. It appears to be of a general ochraceous colour with seven or eight spots on the anterior

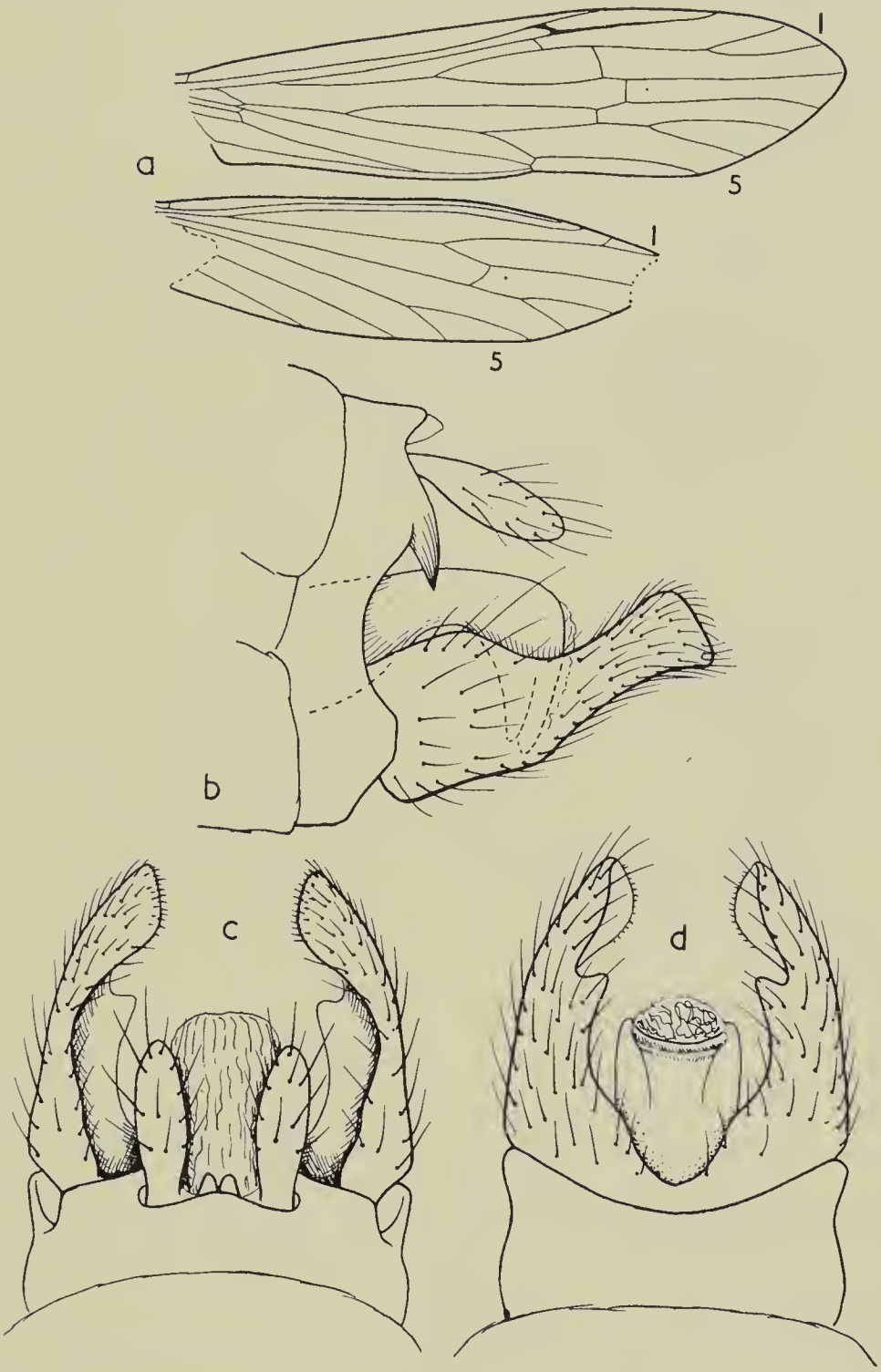

FIG. 204.—*Oecetis arcada* sp. n. ♂. *a*, wings ; *b*, genitalia, lateral ; *c*, dorsal ; *d*, ventral, superior appendages omitted.

wing, formed of clusters of dark hairs which are nearly rubbed off. *Antennae* broken away close to the head, the stump ochraceous without annulations. *Spurs* 1, 2, 2.

In the *anterior wing* fork no. 1 has a long footstalk and the apical cellule containing the facetic spot does not reach the discoidal cell. Other features will be noticed on an examination of the figure.

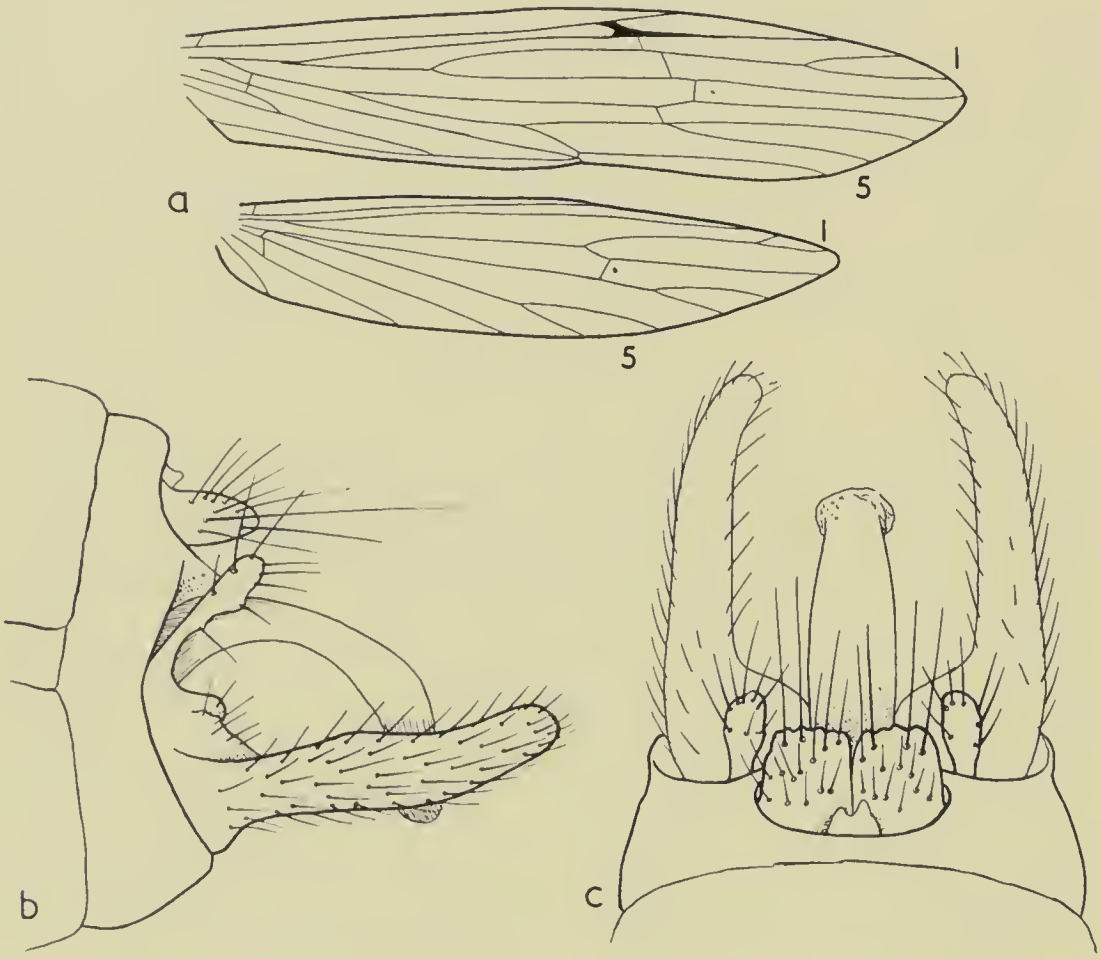

Fig. 205.—*Oecetis parka* sp. n. ♂. *a*, wings; *b*, genitalia, lateral; *c*, dorsal.

Genitalia, ♂.—From above, distal margin of the ninth segment roundly excised at its centre. In the excision is set a pair of small, rounded and fringed superior appendages, their inner margins touching, and above them a pair of small membranous processes. Penis long, bent down at right angles at about two-thirds of its length. Inferior appendages long and almost straight, with a slender fringed basal branch directed distally and slightly upwards.

Length of anterior wing, ♂, 7 mm.

Australia: New South Wales, National Park, 21.x.1926, 1 ♂, R. J. Tillyard.

Type with abdomen mounted in balsam.

The slender fringed basal branch of the inferior appendage separates this from allied species.

Oecetis multipunctata Ulmer (fig. 206).

Oecetis multipunctata Ulmer, 1916, *Ark. f. Zool.*, 10 : 19–20, figs. 23–24.

The single male before me is in poor condition, the wings entirely denuded. *Head* pale fulvous ; *antennae* ochraceous, with blackish annulations. *Palpi*

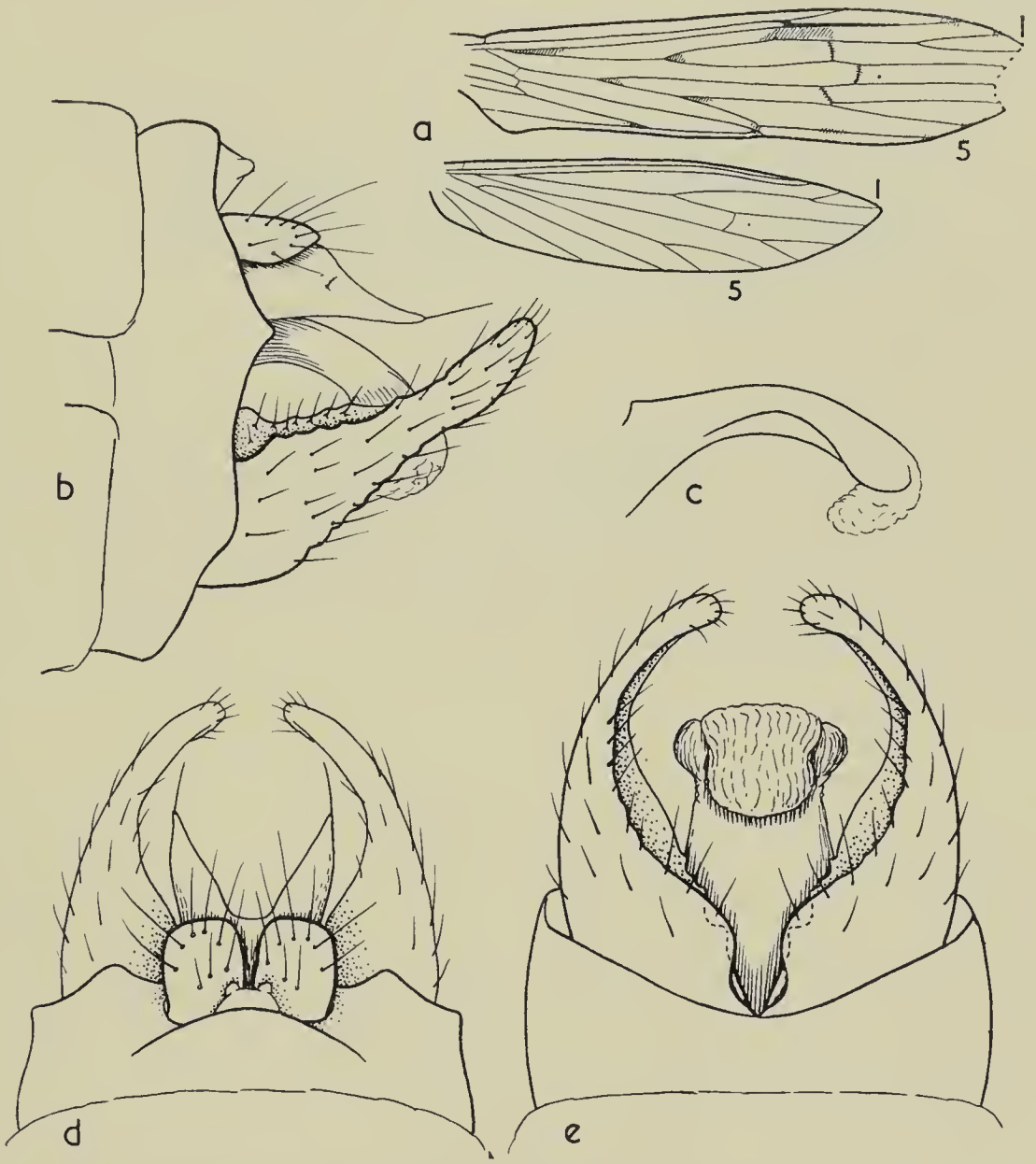

Fig. 206.—*Oecetis multipunctata* Ulmer. ♂. *a*, wings ; *b*, genitalia, lateral ; *c*, penis, lateral ; *d*, genitalia, dorsal ; *e*, ventral.

incomplete, ochraceous. *Thorax* fulvous, *legs* ochraceous, *spurs* 1, 2, 2. *Anterior wing*, membrane marked with brownish as shown in fig. 206. Fork no. 1 as long as its footstalk, M_{3+4} arising at posterior end of *m-cu* cross-vein. Fork no. 5 long, reaching almost to base of discoidal cell. In the posterior wing fork no. 1 is shorter than the fourth apical cell, which is nearly as long as fork no. 5. *Abdomen* fulvous above, ochraceous beneath.

Genitalia.—Ninth dorsal segment slightly produced at centre, with beyond it a small membranous prominence, bearing two short fingers. Superior appendages short and broad from above, rather narrow from the side. Upper penis-cover bifurcate, each fork forming a transparent, divergent, triangular plate, set obliquely on edge, the slender acute apex of each terminating in a single bristle. Penis from the side slender, arching downwards, apex with a membranous dilatation on the lower side ; from above the penis is broad, with a elavate apex. Inferior appendages broad at base, tapering to a slender, incurved apex. From beneath, the appendages resemble a pair of callipers, inner surface towards the base concave, upper margins somewhat serrate, lower sinuous.

Length of anterior wing, 5·5–6 mm.

Australia : Queensland, Cedar Creek, E. Mjoberg (*Type*), in Stockholm Museum : S.E. Queensland, Tambourine Mts., 11–18.iv.1935, R. E. Turner, 1 ♂, in the British Museum (N.H.).

[The example described and figured here differs slightly from Ulmer's description. He does not mention an upper penis-cover, but since this structure is very transparent and scarcely visible except in a stained preparation, little importance need be attached to this discrepancy. He also mentions a dilatation at the base of the inferior appendage on its upper surface, which has the appearance of a hook. There is no such hook in my example, but as the type was described and figured from an uncleared example in fluid, it is possible that the inner basal ridge may have been mis-interpreted. The figure certainly shows this hook as more apparent than real.—D. E. K.]

Oecetis inscripta sp. n. (Kimmins) (figs. 207, 208).

♂. *Head* and *thorax* fulvous, with whitish pubescence. *Antennae*, in the example before me, lacking all but the basal joints, which are fulvous, with whitish hairs. *Palpi* with very short whitish pubescence. *Legs* pale fulvous, with whitish pubescence. *Spurs* 1, 2, 2. *Anterior wing* densely clothed with white and creamy pubescence, and with about five irregular longitudinal brown streaks and some apical brown spots, as in fig. 207. *Posterior wing* hyaline, with pale fulvous pubescence. Anterior wing, fork no. 1 about as long as its footstalk, M_{3+4} arising from Cu_{1a}. Posterior wing about as broad as anterior. *Abdomen* fuscous above, fulvous beneath.

Genitalia.—Dorsal margin of ninth segment triangularly produced and elevated at its centre. Superior appendages short, rather ovate from the side. Upper penis-cover deeply bifurcate, the two forks forming oval plates ; outer margins lower than the inner. No apparent penis-sheaths. Penis

short, curved, lower apical angle produced downward and acute ; there is a fan-like mass of membrane arising from the upper surface. Inferior appendages long, from the side with a deep rounded excision on the upper margin, separating the finger-like apex from the basal hump. From beneath they taper gradually to slightly incurved apices.

Length of anterior wing, 8·25 mm.

Australia : New South Wales, Bathurst, 2400 ft., 12.ix.1884, 1 ♂, McLachlan Collection.

Type, ♂, in form of microscope preparations. The pattern of the anterior wing and the form of the genitalia make this species very distinctive.

Fig. 207.—*Oecetis inscripta* sp. n. ♂ wings. (Photo. D. E. K.)

Oecetis laustra sp. n. (fig. 209).

Insect greyish ochraceous, mottled with dark points on the anterior wing, more particularly at the anastomosis. Membrane of the tergites granulate but not so punctate as in some of the *Oecetis* species, as, for instance, *notata* Rambur.

Genitalia, ♂.—From above, margin of the ninth segment lightly chitinized and produced. Superior appendages centrally placed, short and stout, broadly triangular from the side ; beneath these there is a short, upper penis-cover, apex excised, very transparent. A short penis, which is bent abruptly downwards towards the apex, the bent portion being somewhat membranous and terminiatng in a chitinized point. This bent portion may be part of a lower penis-cover, the apical point being trough-shaped from beneath. Inferior appendages broad and thick, with both upper and lower margins humped towards the base as seen from the side. The appendages, towards the apices

FIG. 208.—*Oecetis inscripta* sp. n. ♂. *a*, wings; *b*, genitalia, lateral, with inset of penis; *c*, dorsal; *d*, inferior appendages, ventral.

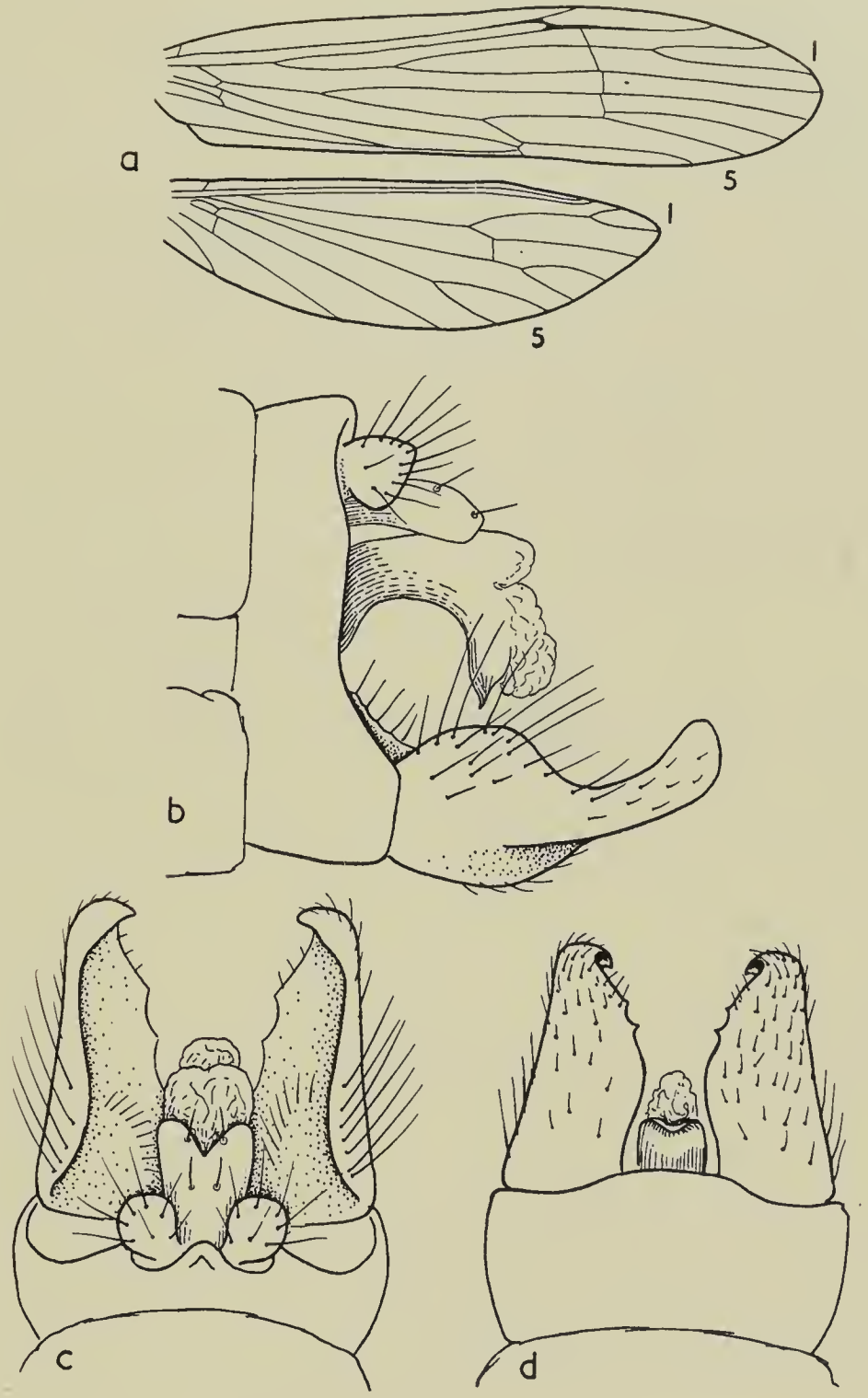

FIG. 209.—*Oecetis laustra* sp. n. ♂. *a*, wings; *b*, genitalia, lateral; *c*, dorsal; *d*, ventral.

are upturned slightly and more slender than the bases; from beneath, the inner margins are slightly serrate.

Length of the anterior wing, ♂, 9 mm.

AUSTRALIA: W. Australia, Yanchep, 32 m. N. of Perth, 13–23.ix.1935, 1 ♂ (*type*), 1 ♀, R. E. Turner. Queensland, Brisbane, 7, 27.ix.1916, 2 ♂, Tillyard Collection.

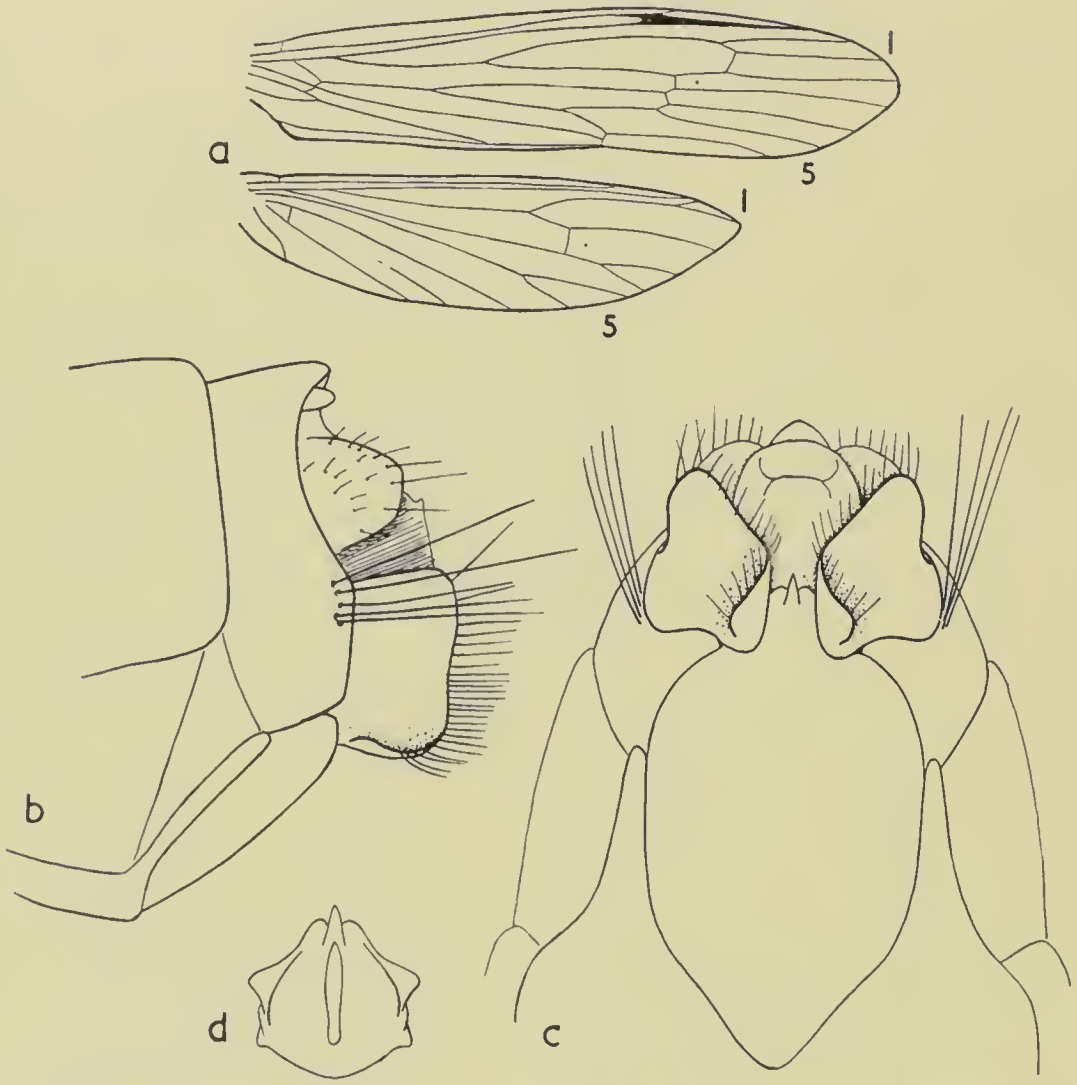

FIG. 210.—*Oecetis lurida* sp. n. ♀. *a*, wings; *b*, genitalia, lateral; *c*, ventral; *d*, vaginal structure, ventral.

The absence of streaks on the wings, and the broad, thick inferior appendages separate *O. laustra* from *O. inscripta*.

Oecetis lurida sp. n. (Kimmins) (fig. 210).

♀. General colour pale ochraceous, with pale pubescence. *Wings* hyaline, with pale venation, densely clad with ochraceous pubescence. *Anterior wing*

with apical fork no. 1 slightly overlapping the discoidal cell, which is longer than its footstalk, and extends nearly to the base of the thyridial cell. Posterior branch of media arises from the *m-cu* cross-vein. *Posterior wing* with a vestigial vein, incomplete basally in the cell behind Cu_2.

Genitalia, ♀.—Ninth tergite produced at the centre of its apical margin, below which is a pair of minute conical projections. Fused to the margin on each side of the central projection is a rounded appendage. Arising from each lower apical margin is a truncate plate or valve, set on edge, its lower margin rounded and out-turned. Between these appendages is a short tubular piece. Ninth sternite in form of an ovate, transparent plate, set in the deeply excised apical margin of the eighth sternite.

Length of anterior wing, 11 mm.

AUSTRALIA : New South Wales, Broken Hill., 8 ♀, Lower Collection. *Type*, ♀, pinned.

On venational characters this species will fall into the *unicolor-pechana* group, with apical fork no. 1 in the anterior wing somewhat overlapping the discoidal cell. The vestigial vein in the anal area of the posterior wing also occurs in some examples of *O. pechana*. The pale colour of the unspotted wings and of the body is very distinctive, and it seems justifiable to describe this species as new on the female sex only.

Oecetis unicolor (McLachlan) (figs. 211, 212).

Setodes unicolor McLachlan, 1868, *Journ. Linn. Soc. Lond. Zool.*, **10** : 203–204, 213. pl. 2, fig. 7.
Setodes unicolor McLachlan, 1873, *Ann. Mag. N. H.*, (4) **12** : 41.
Setodes unicolor Hutton, 1899, *Trans. N. Zeal. Inst.*, **31** : 243.
Setodes unicolor Hudson, 1904, *N. Zealand Neur.* : 78.
Oecetis unicolor Ulmer, 1906, *Notes Leyd. Mus.*, **28** : 41.
Oecetis unicolor Ulmer, 1907, *Gen. Insect.*, **60a** : 144.

McLachlan describes the species as follows :

" *Head—antennae* greyish-ochreous, a black mark at the sutures, basal joint with greyish-yellow hairs ; *vertex* and *face* clothed with greyish-yellow hairs : *palpi* greyish-ochreous, thickly clothed with greyish-yellow hairs ; *maxillary* with the first and fourth joints nearly equal in length, second and third very long, fifth nearly equal to the third : *eyes* black."

" *Thorax* greyish ; mesoscutellum somewhat blackish."

" *Wings—anterior wings* very long and narrow, greyish-yellow, densely pubescent, the anastomosis somewhat marked with fuscous, and there are also fuscous dots on the dorsal and round the apical margins (these dots are visible only in well-conditioned individuals) ; fringes concolorous with the membrane, except at the anal angle, where they are blackish fuscous ; neuration indistinct ; subcosta ending at about half the length of the wing from the base ; radius ending at one-fifth of the length from the apex ; discoidal cell and cellula thyridii very long ; upper branch of the ramus thyrifer simple ; anastomosis irregular : *posterior wings* pale-greyish, subhyaline ; fringes grey, very long towards the base of the dorsal margin ; neuration pale."

FIG. 211.—*Oecetis unicolor* (McLachlan). ♂ type. *a*, wings; *b*, genitalia, lateral; *c*, inferior appendage from within; *d*, penis and sheaths, lateral; *e*, genitalia, dorsal; *f*, penis and sheaths, dorsal; *g*, genitalia, ventral, upper penis-cover omitted.

"*Legs* pale greyish-ochreous ; the coxae brownish ; tibiae and tarsi with minute blackish spines on the underside ; anterior tibiae with one short spur."

"*Abdomen* dull greyish-ochreous, with a greyish tinge, the dorsum darker. In the ♂ the upper edge of the last segment is fringed with rather long pale hairs ; the

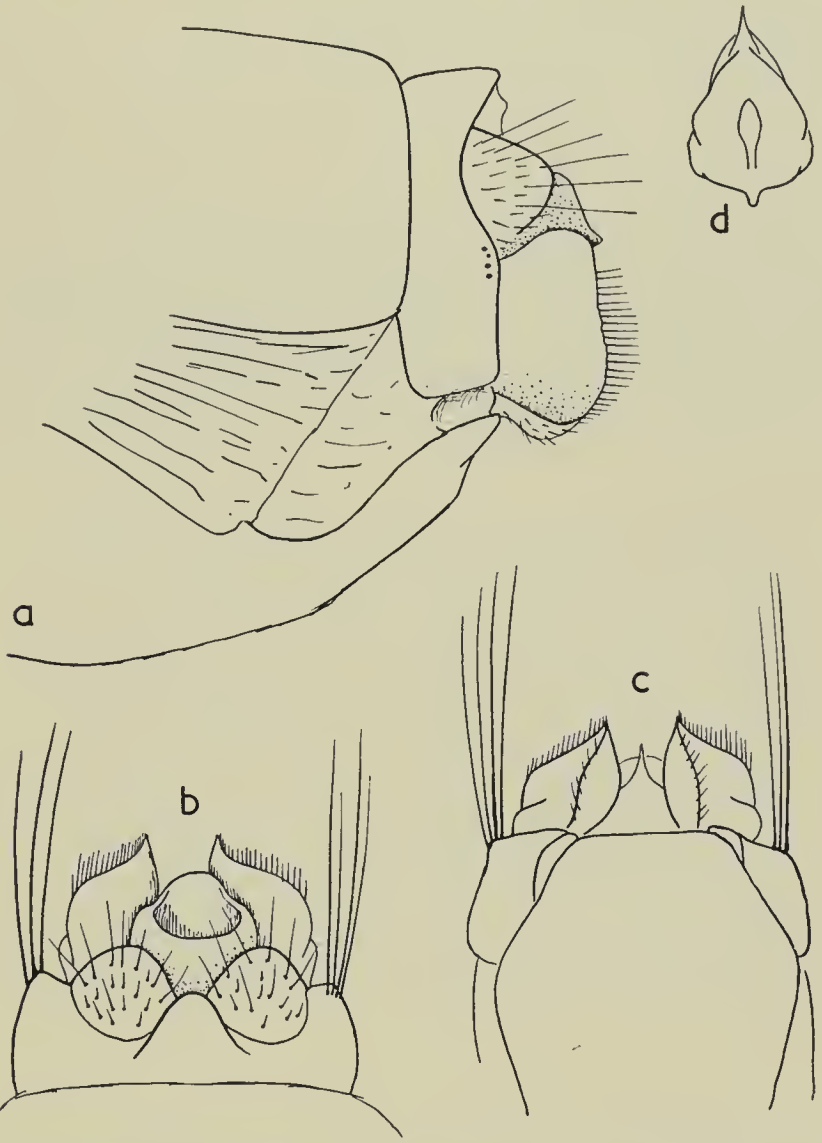

Fig. 212.—*Oecetis unicolor* (McLachlan). ♀ paratype. *a*, genitalia, lateral ; *b*, dorsal ; *c*, ventral ; *d*, vaginal structure, ventral.

app. sup. are small and broad, scarcely extending beyond the lateral margins ; app. inf. forming two elongately triangular valves placed close together."

" Long. corp. $2\frac{3}{4}'''$; exp. alar. $9–10\frac{1}{2}'''$."

" Christchurch, Canterbury (*Fereday*) 5♂."

Type, with the abdomen mounted in balsam, in the British Museum (N.H.).

[To McLachlan's description may be added :

Wings.—In addition to the pubescence there is in the centre of the male

anterior wing a narrow patch of seed-like hairs. The area extends about the length of the discoidal cell, between the lower margin of this cell and Cu_{1a}.

Genitalia, ♂.—Abdominal pleurae and some of the segments partly devoured by pests, but the genitalia are undamaged. Ninth segment short, deep, somewhat laterally compressed ; from above, the dorsal margin is elevated in a triangular projection. Superior appendages short and rounded, with long hairs. Upper penis-cover about twice as long as superior appendages, forming a shallow, transparent hood, from above parallel-sided to about mid-way, then tapered to form a triangle. Penis and its associated structures somewhat obscure. There are two asymmetric sheaths, one long and spine-like, the other much broader about mid-way, the lateral margins here curved down and apparently fused to the lower penis-cover, thus encircling the spine-like sheath. Penis probably membranous, also encircled by the sheath and cover ; the duct visible, entering through an aperture on the ventral surface of the lower penis-cover. The latter is trough-shaped, its apex from the side appearing as a down-turned hook. Inferior appendages broad at their bases : upper margin from the side with a rounded, incurving hump in the basal half ; apex produced in a slender, up-curved finger. From below they are moderately broad and incurved, with rounded apices. On the inner surface towards the base is a curved ridge set with short spines, and a small setiferous process.

Genitalia, ♀.—Ninth segment with a pair of rounded appendages, set one on each side of a raised median process. Below, and partly fused with these appendages, is a tubular piece, obliquely truncate from the side, so that the lower margin projects in a rounded lip. On each side of the tubular piece, and at a lower level, is a fringed plate or valve, set on edge, concave in its lower half, the ventral margin curving outward. Ninth segment laterally with three or four long, strong setae. Between the valves, in ventral aspect, can be seen a short, acute spine, apparently part of the vaginal structure. Eighth and ninth sternites apparently fused.—D. E. K.]

Tillyard (1929, *Ins. Austral. N. Z.*, p. 392) says of the habits of this species:

"Its larva lives in lakes, forming its case of the water-weed *Nitella*, and is an important article of diet for the introduced trout."

Oecetis pechana sp. n. (figs. 213-215).

Head dark ochraceous with tawny hairs. Oculi black. *Antennae* ochraceous without annulations. *Wings* narrow and with acute apices. Anterior dark ochraceous with widely scattered dark, round spots, equidistant along the lower apical border. An area in the centre of the wing clothed with brownish scale-like hairs. Neuration resembling that of the New Zealand species, *Oecetis unicolor* McLachlan. *Spurs* 1, 2, 2.

Genitalia, ♂.—Ninth dorsal segment from above, with an acute upper part sloping downward to a slightly excised lower margin ; beneath this is a membranous, triangular upper penis-cover, apex produced and acute. *Penis* probably membranous. Sheaths asymmetric, directed slightly to one side : they are both very long, partly withdrawn in the type with their bases situated

as far back as the centre of the sixth segments. Lower penis-cover broad from the side, apex produced downward in a blackened hook. From above, with an asymmetric, somewhat rectangular shelf on one side of the upper margin.

Inferior appendages from the side, very broad and short, having the appearance of a boot with the heel and sole uppermost, toe acute, heel fringed with long hairs and from above, turning over inwards ; very broad from beneath with a circular excision of the inner margin in the apical half. Margin of the ninth ventral segment widely excised and sinuous.

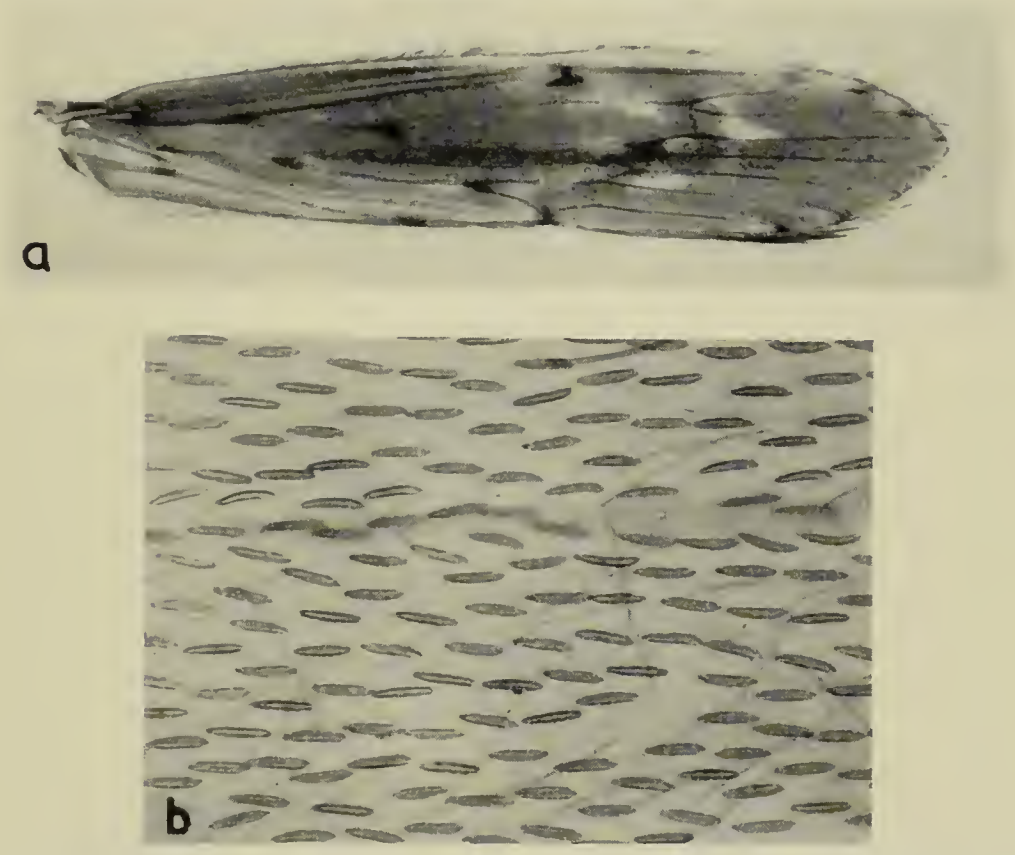

Fig. 213.—*Oecetis pechana* sp. n. ♂. *a*, anterior wing (Photo. D. E. K.) ; *b*, specialized hairs of anterior wing × 150 (Photo. B. M. N.H.).

[*Genitalia*, ♀.—Differing only in detail from *O. unicolor* McLachlan. The tubular piece, from the side, has a right-angled excision of the apical margin, the lower lip thus formed being more protruding. The lateral valves from above or beneath are rounded apically, not acute. From the side there is a shallow excision towards the lower apical margin.—D. E. K.]

Length of anterior wing, ♂, 8 mm ; ♀, 7 mm.

Australia : W. Australia, Yanchep, 20–31.xii.1935, 14 ♂, 2 ♀, R. E. Turner ; Perth, 7.x.1886, 1 ♂, McLachlan Collection. Queensland, Stanthorpe, 22.ix.1922, 1 ♂, Brisbane, 21.vi.1919, 1♀, Tillyard Collection.

Type, ♂ (Yanchep), is a microscope preparation in balsam.

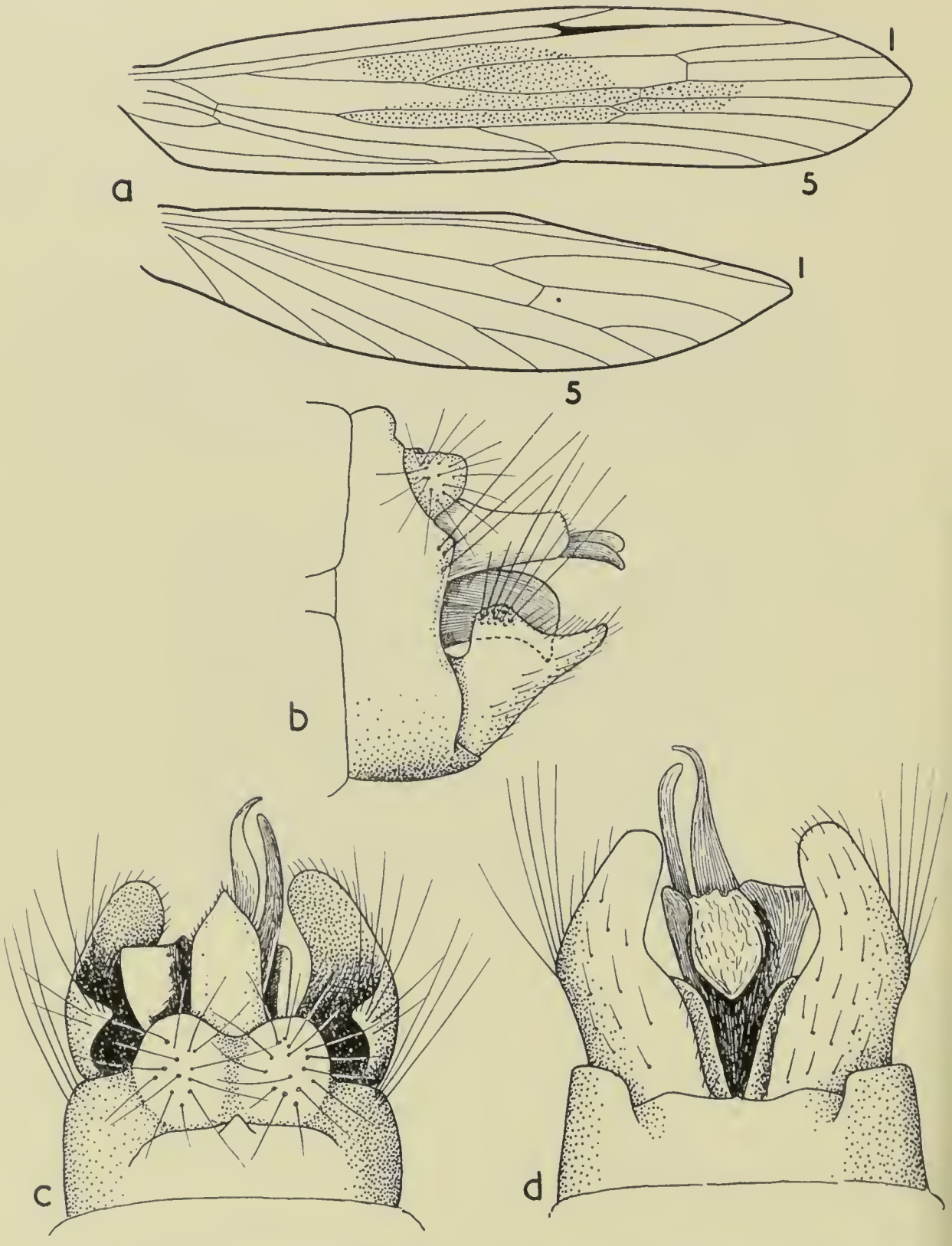

FIG. 214.—*Oecetis pechana* sp. n. ♂. *a*, wings; *b*, genitalia, lateral; *c*, dorsal; *d*, ventral.

[*O. pechana* is clearly allied to *U. unicolor* but the different arrangement of the specialized hairs on the ♂ anterior wing and the differences in the genitalia should render the two easily separable, apart from the difference in locality. This species may possibly prove to be a synonym of *O. australis* Banks, but as no figures or descriptions of genitalia are given, nor is any mention made of either the sex or the presence of specialized hair-scales, it seems wiser to consider the two species distinct.—D. E. K.]

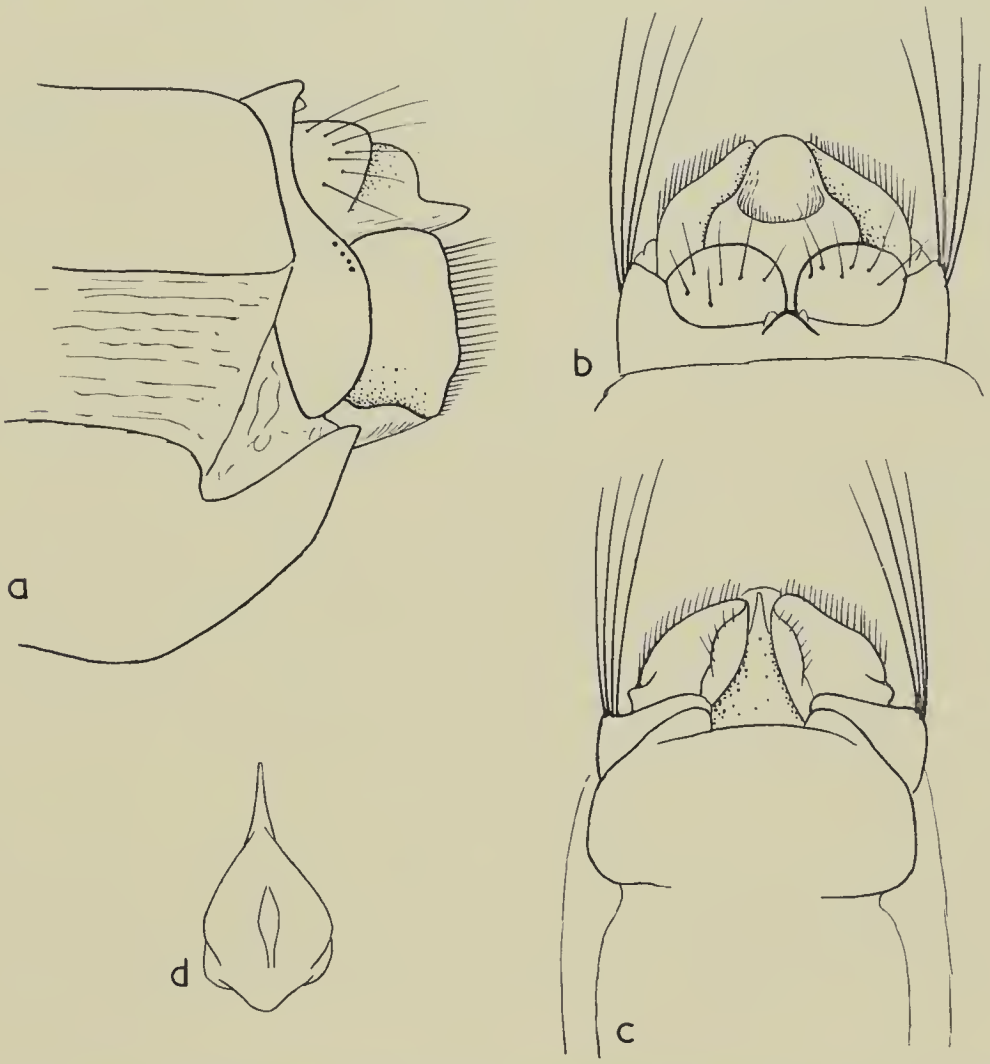

Fig. 215.—*Oecetis pechana* sp. n. ♀. *a*, genitalia, lateral; *b*, dorsal; *c*, ventral; *d*, vaginal structure, ventral.

Oecetis australis (Banks).

Oecetina australis Banks, 1920, *Bull. Mus. Comp. Zool. Harv.*, 64 : 350–351.

Banks describes the species as follows :

" Pale yellowish, clothed with gray hair ; antennal joints dark on base ; legs pale yellowish, with numerous black tarsal spines. Fore wings pale, veins pale,

cross-veins darker, clothed with gray and dark brown hair, small spots of dark hair at forking of veins, over cross-veins, and arculus, most noticeable near arculus and at end of subcosta: outer costal fringe brown, posterior fringe gray; hind wings with brown fringe. The subcosta ends free but the radius outward from the connecting cross-vein is thicker than elsewhere: discal cell very long, longer than its pedicel. first fork a short distance back on discal cell. In hind wings the first fork is small but distinct, third fork with a pedicel more than one half its length, fifth fork as long as third."

"Expanse, 14 mm."

"Victoria: Melbourne (Thorey)."

Type in the Museum of Comparative Zoology, Harvard College, U.S.A.

I am not acquainted with this species; no description or figure of the genitalia has been given, nor is the sex mentioned.

12. Fam. **HYDROPSYCHIDAE** Curtis.

Curtis, 1835, *Brit. Ent.*: 601.
McLachlan, 1878, *Rev. Syn. Trich.*: 350.
Ulmer, 1907, *Gen. Insect.*, **60a**: 153.

Spur formula variable, anterior tibia never with a sub-apical spur, mostly with two apical spurs. Middle legs of female often dilated. *Antennae* thin or very thin, generally as long as or longer than the anterior wing. The basal joint thicker than the others, about as long as the head or shorter. *Palpi* with articulated terminal joint. *Maxillary palpi* long, thin, not very hairy, the second joint without a tuft of strong bristles at the apex; in both sexes always five-jointed, the last joint flexible. Labial palpi with the third joint flexible. Ocelli lacking. Eyes moderately large. *Neuration* variable. Fork no. 1 of anterior wing always present and stalked. *Genitalia* of male without superior appendages, with a hood-like dorsal plate. Penis simple, or sometimes with spines or a dilated apex. No penis-sheaths. Inferior appendages usually two-jointed, long and slender.

Key to Subfamilies.

1. Antennae about as long as anterior wing; palpi always present; discoidal cell of anterior wing always present and closed. Hind wing never with a subdiscoidal cell . . . . . *Hydropsychinae* Ulmer (p. 315).
–. Antennae much longer than anterior wing; palpi sometimes wanting; discodial cell of anterior wing often open or entirely wanting. Hind wing always with a subdiscoidal cell, i.e., Rs forks first at the anastomosis, or the discoidal cell is open . . . . . *Macroneminae* Ulmer (p. 306).

Subfam. **MACRONEMINAE** Ulmer.*

Macronematinae, Ulmer, 1905, *Stett. ent. Zeit.*, **66**: 40.
Macronematinae, Ulmer, 1907, *Gen. Insect.*, **60a**: 154.
Macronematinae Ulmer, 1907, *Coll. Zool. Selys*, **6** (2): 1–121.

Spur formula variable. Middle leg of male not or only slightly widened; female always widened, often strongly so. *Antennae* slender, at least twice as long as anterior wing, shorter in the female than in the male. *Palpi* either

* The change in the name of the typical genus from *Macronema* to *Macronemum* renders it necessary to alter the name of the subfamily to *Macroneminae*.– D. E. K.

completely lacking, or long and thin. Proportions of the joints variable, but the fifth always at least as long as the others together. First two joints never equal or remarkably thick. *Anterior wing* generally sparsely pubescent or glabrous, often brightly coloured. At the base of the costal area is a chitinized furrow, and there are often false costal cross-veins. Discoidal cell closed, open or lacking ; median cell always present. Forks nos. 1, 2, 3, 4 and 5, or less often 1, 2, 3 and 4 present. Shape and neuration of anterior wing often differing in the two sexes. *Posterior wing* always broader than anterior, never with a closed discoidal or median cell. Costal area with wing-coupling hooks. Rs often forks first at the anastomosis, consequently the lower branch is lacking, and there is formed between Rs and the following vein a long cell, the " subdiscoidal cell." Forks 2 and 3 always present ; fork no. 5 seldom absent ; fork no. 1 often present.

In the Australian region, so far only one genus, *Macronemum*, has been recognised.

Macronemum Pictet.

Macronema Pictet, 1836, *Mem. Soc. Phys. Hist. Nat. Genève*, **7** : 399.
Macronemum Burmeister, 1839, *Handb. Ent.* **2** : 915.
Macronema Ulmer, 1907, *Gen. Insect.*, **60a** : 164.
Macronema Ulmer, 1907, *Coll. Zool. Selys.*, **6** (2).
Macronemum Ross, 1944, *Ill. Nat. Hist. Surv. Bull.*, **23** : 114.

Spurs varying, usually 2, 4, 4, but sometimes 1, 4, 4, or 0, 4, 4. Intermediate tibiae and tarsi never sensibly dilated in the ♂ and often only slightly so in the ♀. *Antennae* very long and slender, often twice the length of the wings in the ♂, rather shorter in the ♀. Basal joint very bulbose, second joint transverse, the succeeding joints very long. *Maxillary palpi*, the first four joints more or less thick or dilated ; basal joint short, second shorter than the third, fourth slightly shorter than the second, fifth as long as the rest united. Labial palpi very small. *Ocelli* absent. *Anterior wing* always elongate, more or less elliptical at the apex, rarely pubescent, usually sub-diaphanous and shining. Discoidal cell very small, median cellule present and rather larger ; cellula thyridii very long. Forks nos. 1, 2, 3, 4 and 5 all present. *Posterior wing* much shorter than the anterior, very broad, the anal portion greatly dilated, broadly folded. Discoidal cell wanting ; median cell wanting. Forks nos. 2, 3 and 5 present. Costal margin generally with a series of minute hooklets and excised before the apex.

Type species.—*Macronema lineatum* Pictet, 1836.

[The name *Macronema* Pictet, 1836, is a homonym of *Macronema* (Megerle MSS) Stephens, 1829 (*Syst. Cat. Brit. Ins.*, p. 217 [Coleoptera]), and Burmeister's emendation *Macronemum* is used by Ross, 1944, as the first available synonym of *Macronema* Pictet. The name *Macronemum* being a correct emendation of *Macronema* Pictet, it follows that *Macronema* Stephens also should be emended to *Macronemum* and thus Burmeister's emendation would become a homonym of *Macronemum* in Coleoptera. The name *Macronema* does not appear to have been adopted by Coleopterists and it is not listed in Junk's Catalogue. It is proposed therefore that an application be made to the International Commission on Zoological Nomenclature to suppress the generic name *Macronema* (Megerle MSS) Stephens, 1829, and to place on the Official list of Generic Names the name *Macronemum* Pictet, 1836 (type species *Macronema lineatum* Pictet, 1836).—D. E. K.]

Key to Species of *Macronemum*.

1. Anterior wing pale brownish, with indefinite yellowish markings. ♂ inferior appendages single-jointed . . . . . *M. dubium* (Ulmer) (p. 308).
–. Anterior wing other than pale brownish with indefinite yellowish markings. ♂ (where known) with two-jointed inferior appendages . . . . . 2.
2. Anterior wing brownish with a definite pattern of yellow spots and streaks *M. australe* (McLachlan) (p. 308).
–. Anterior wing blaekish with varying patterns of yellow or gold spots . . 3.
3. Anterior wing blaekish, with a single oblique golden streak at pterostigma *Macronemum* sp. ♀ (p. 314).
–. Anterior wing with more than one spot . . . . . 4.
4. Anterior wing with numerous (more than thirty) yellowish spots *M. banksi* nom. nov. (p. 312).
–. Anterior wing with four large and several small golden spots (less than thirty) *M. pulchripenne* (Tillyard) (p. 313).

Macronemum dubium (Ulmer) (figs. 216, 217).

Macronema dubium Ulmer, 1905, *Ann. Soc. ent. Belg.*, **49** : 28, figs. 15, 16.
Macronema dubium Ulmer, 1907, *Gen. Insect.*, **60a** : 165.
Macronema dubium Ulmer, 1907, *Coll. Zool. Selys*, **6** (2) : 103, fig. 107.

[*Head* brownish, flattened above, with two large rounded warts and a smaller triangular one. *Antennae* brownish, towards the base annulated with darker brown. *Maxillary palpi* brownish. Joints one and two short, three rather longer than one and two together, four about as long as two, five as long as the first four together. *Pronotum* short, brownish ; meso- and metanota dark brown. *Legs* yellowish brown, tibiae and tarsi of median legs of male slightly, and of female more strongly dilated. *Anterior wing* long and narrow, apical margin slightly concave. Membrane nearly glabrous, pale brownish, with yellowish markings as in fig. 216. Venation brownish. *Posterior wing* greyish. *Abdomen* yellowish brown.

Genitalia, ♂.—Ninth tergite somewhat produced and rounded, its margin fringed with long hairs. Dorsal plate deep, its apical margin bifid to form two rounded lobes, its upper margin from the side with a rectangular excision. Penis broad at its base, with a slender stem and a dilated, heavily pigmented apex. Inferior appendages single-jointed, long, sinuous from the side, curving inwards from beneath.

Length of anterior wing, ♂, 18 mm., ♀ 16 mm.

The *type* is from Australia, without other data (Paris Museum). There is a series of 6 ♂, 1 ♀ from New South Wales, Upper Murrumbidgee River, Adaminaby, 11.xii.1936, and 1♂, Cottar River, 15.xi.1929, R. J. Tillyard, in the British Museum (N.H.) from which the accompanying figures and description have been made.—D. E. K.]

Macronemum australe (McLachlan) (figs. 218).

Monopseudopsis inscriptus Walker, 1852, *Cat. Neur. Brit. Mus.* : 105.
Macronema australis McLachlan, 1862, *Trans. Ent. Soc. Lond.*, (3) **1** : 308–309.
Macronema australis Hagen, 1864, *Verh. Zool. Bot. Ges. Wien*, **14** : 845.

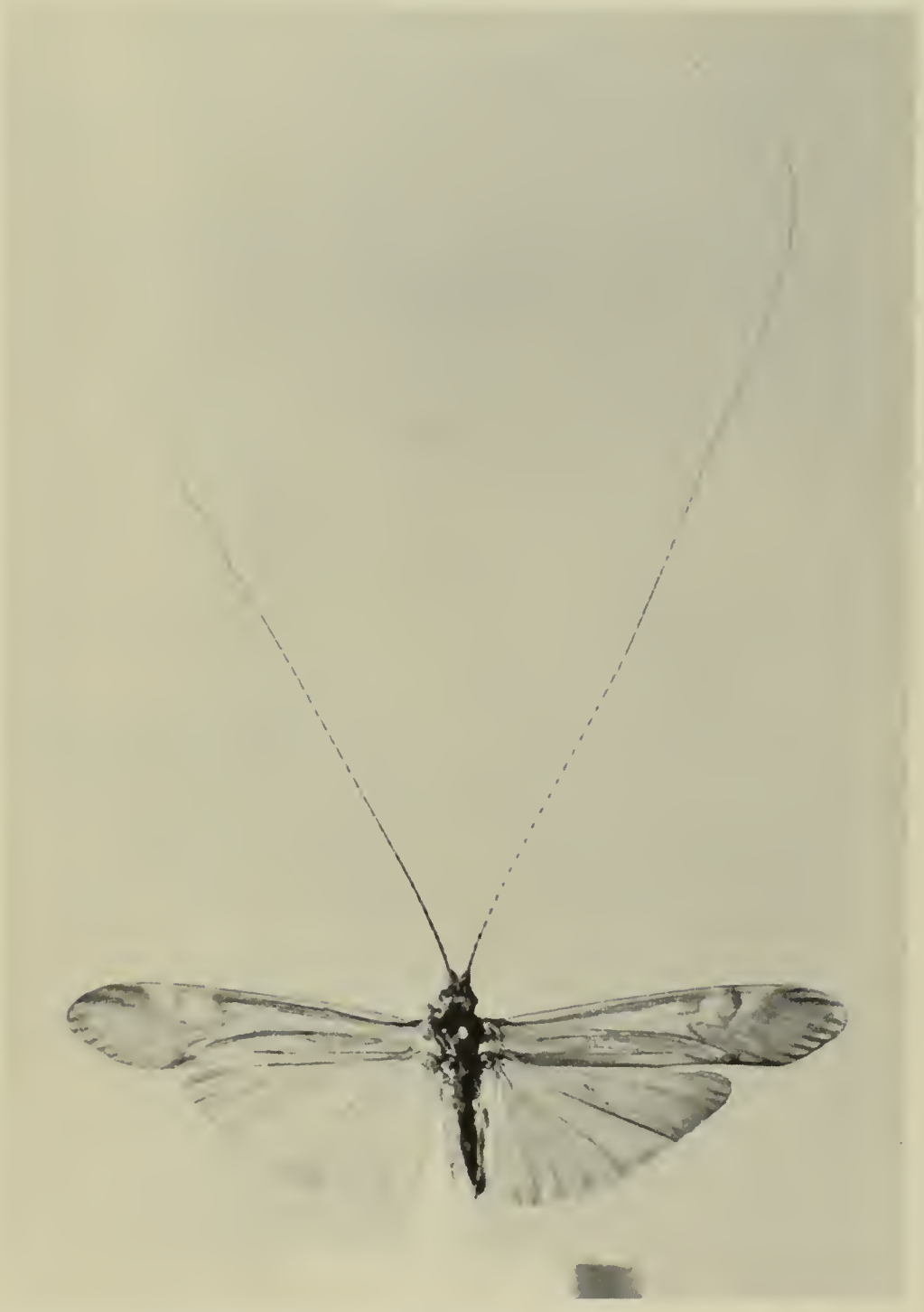

FIG. 216.—*Macronemum dubium* (Ulmer). ♂. × 2½ (Photo. D. E. K.)

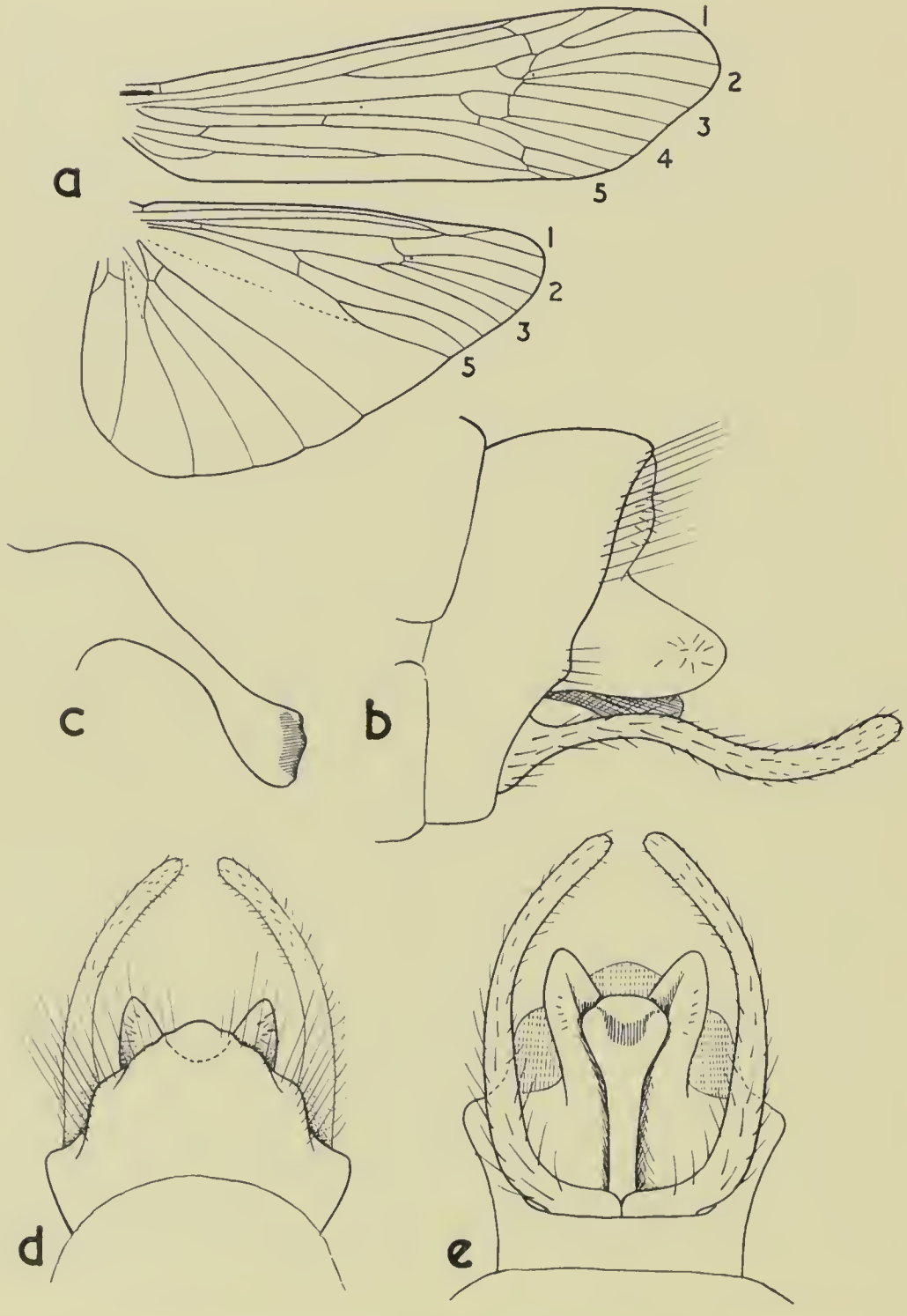

FIG. 217.—*Macronemum dubium* (Ulmer). ♂. *a*, wings; *b*, genitalia, lateral; *c*, penis, lateral; *d*, genitalia, dorsal; *e*, ventral.

Macronema australe Ulmer, 1907, *Gen. Insect.*, **60a** : 165.
Macronema australe Ulmer, 1908, *Coll. Zool. Selys*, **6** (2) : 102, pl. 6, fig. 38.
Macronema australe Betten and Mosely, 1940, *F. Walker Types Trich. B.M.* : 193.

Walker describes the species as follows :

" Black, with a slight hoary tinge : head clothed with short black hairs above, with ferruginous hairs beneath : antennae longer than the body ; second, third,

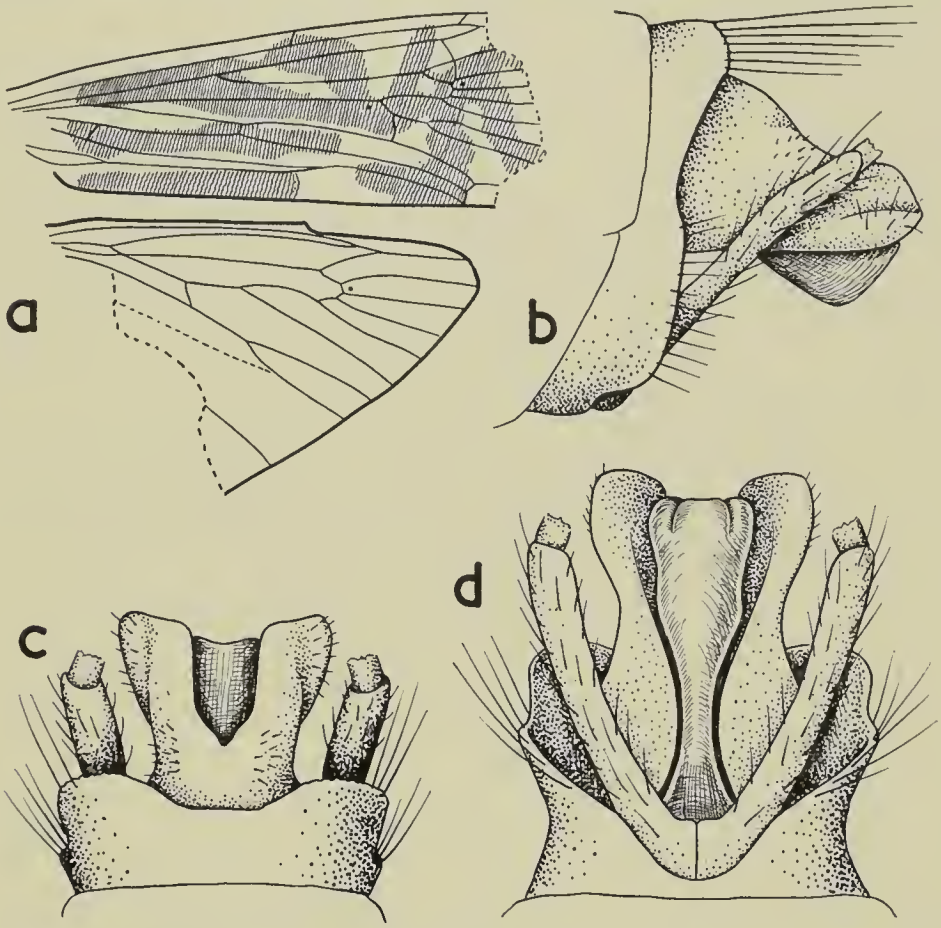

Fig. 218.—*Macronemum australe* (McLachlan). ♂. *a*, wings ; *b*, genitalia, lateral ; *c*, dorsal ; *d*, ventral.

and fourth joints ferruginous : palpi and legs yellow : fore-wings lurid, with three yellow stripes, one on each border and one on the disk, and with six large irregularly-triangular yellow spots, three resting on each border ; tips gray, with a large almost round hyaline spot in the disk : hind-wings pale gray, with two almost colourless marks near the tip of the fore border ; veins pale. Length of the body 4½ lines ; of the wings 14 lines."

" *a*. New Holland. Presented by the Entomological Club."

To this a description of the ♂ *genitalia* is added.

Apical margin of the ninth tergite widely and shallowly exeised at its centre ; below it is an upper penis-cover, widely forked, apiees of the forks truncate.

Penis arises from a slender stem, apex dilated and somewhat elongated; apical margin truncate. Inferior appendages two-jointed, broken in the type.

McLachlan transferred the species from Walker's *Monopseudopsis* to *Macronema* in 1862, this change involving its renaming since *inscriptus* was pre-occupied in *Macronema*.

Type in the British Museum (N.H.).

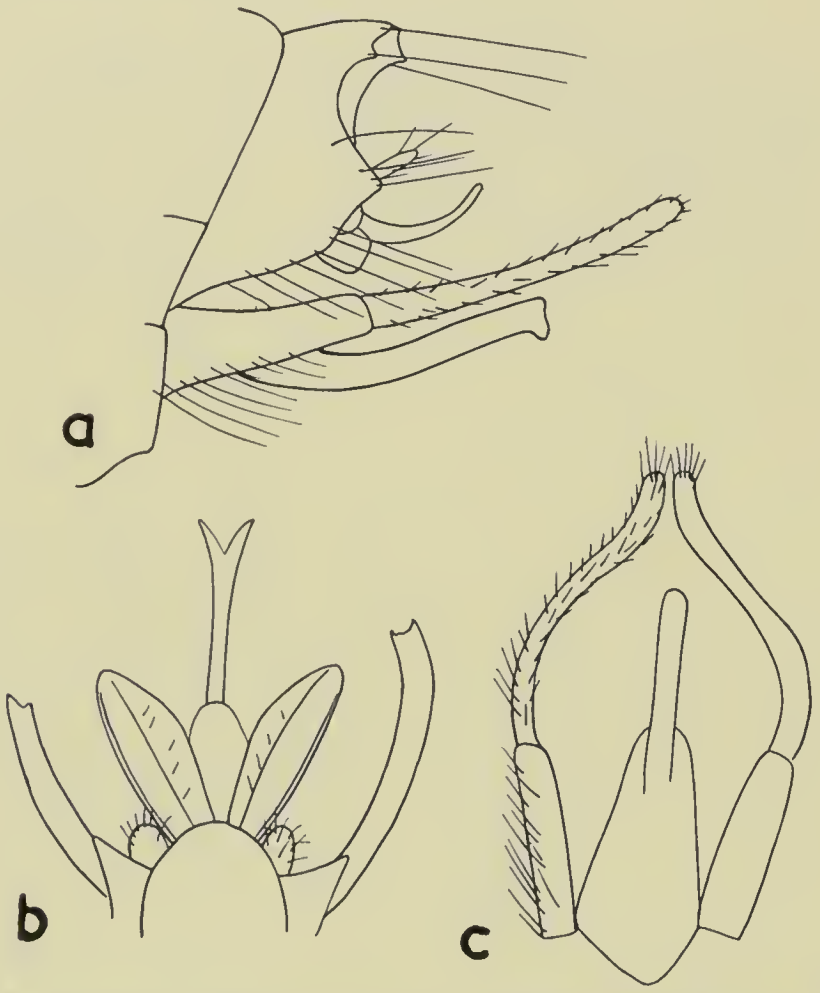

Fig. 219.—*Macronemum banksi* nom. nov. ♂ genitalia (after Banks). *a*, lateral; *b*, dorsal; *c*, inferior appendages and penis, ventral.

Macronemum banksi n. n. (fig. 219).

Macronema tristis Banks, 1939, *Bull. Mus. Comp. Zool. Harv.*, 85 : 487–488, figs. 58, 61.

Banks describes the species as follows :

"Head black, a large pale spot below each eye; palpi pale; antennae pale, basal joint dark above, beyond dark at tips of joints; thorax dark, mesonotum nearly black; legs pale, tarsi rather darker; abdomen dark above and below. Wings dark gray, clothed with short black hair; in fore wings between veins are a number of yellowish spots of good size, but not especially bright; one occupying most of discal cell, one above and just before and two above and just beyond discal

cell, first apical cell with one at base and one at tip, second cell with two also, third cell (fork two) with two near base, and four near tip, fourth cell with two near base, three beyond middle, and one at tip, fifth cell with several nearly confluent spots, sixth with three near base, two near middle, and one at tip, seventh cell with one near base, two near middle, and one at tip, eighth with two near base, one near middle, and one at tip ; anal cell with a row, and several spots between anastomosis and base of wing. In fore wing discal cell short, triangular, fork one with a pedicel nearly equal discal cell ; fork two at lower angle of discal cell, fork three scarcely a bit further back than two, fork four back further, before the base of discal cell. Male appendages show two slender ventral claspers, apical part much incurved, two short curved submedian pieces, from above, seen as divergent plates, with hyaline inner half, above them a pair of short, hairy projections ; tip of penis forked."

"Fore wing ♂ 11 mm., ♀ 8 mm."

"From Ravenshoe, Atherton tableland, 3000ft., 27 April, and Rock Scrub, McIlwraith Range, 17 to 29 June, both Queensland, Australia. (Darlington)."

Type in the Museum of Comparative Zoology, Harvard College, U.S.A.

I rename the species *banksi* as it is a homonym of *Macronema triste* Navás.

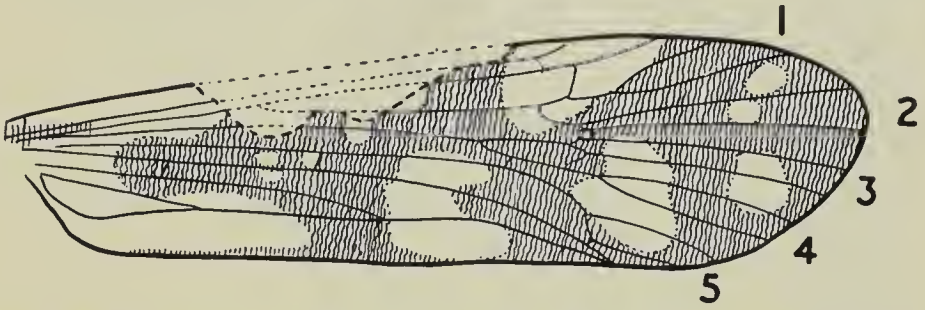

Fig. 220.—*Macronemum pulchripenne* (Tillyard). Reconstruction of anterior wing of ♀ type.

Macronemum pulchripenne (Tillyard) (fig. 220).

Macronema pulchripenne Tillyard, 1922, *Aust. Zool.*, 2 : 83, pl. 24A, fig. 3.

Tillyard describes the species as follows :

"♀. *Total length* 9, *fore wing* 11, *expanse* 23·5 mm."

"Head black, with sparse golden hairs on epicranium. *Antennae* slender, 18 mm. long, black. *Palpi* pale grey."

"Thorax : *Prothorax* black with two round golden spots on pronotum. *Meso-* and *metathorax* black, the mesonotum with a large central patch of bright golden pubescence. *Legs* greyish brown ; *tibial spurs* long."

"Abdomen dull black throughout ; in shape somewhat broad and flattened, narrowing towards apex ; no prolongation of tenth tergite."

"Wings : Smooth and shiny, without any conspicuous hairs, densely pigmented in gold and black. *Forewing* black, marked with gold as follows : Base of wing gold, with an extension along costa to half-way, notched at about two thirds of its length by an intrusion of the black colour from below ; another extension of the gold runs along basal third of posterior margin ; pterostigma with a large subtriangular blotch of gold ; a large irregular reniform blotch half-way along posterior border ; another

slightly smaller and more rounded blotch close to tornus. Near apex there are three smaller spots, the largest of which is near middle of termen, while two very much smaller ones lie above it near costa. Two or three very minute golden spots are scattered on the black portion of the wing at about one-third from base, and another very small one lies below the pterostigmatic blotch. *Hindwing* with basal two-thirds golden, the rest black, the costa with a narrow extension of the gold up to two-thirds of its length, where it swells out into a small semi-oval golden patch. The division between the gold and black across the wing very irregular."

"Habitat: Stanwell Park, N. S. W. Three females taken by Mr. G. Lyell, F. E. S. on April 24th, 1916."

"Types: Holotype ♀ in the Tillyard Collection [now in the British Museum (N.H.)]. Also a paratype ♀ in the Cawthron Institute, Nelson, N.Z., and another in the collection of the Museum of Comparative Zoology, Harvard College, U. S. A."

FIG. 221.—*Macronemum* sp. ♀. × 8 (Photo. D. E. K.).

Unfortunately almost the whole of the type has been devoured by insect pests in Canberra so that only portions of the two anterior wings remain. [These wings are, however, not "smooth and shiny" but have a definite gold and black pubescence.—D. E. K.]

Macronemum sp. ♀ (fig. 221).

[In the Tillyard Collection was a single female *Macronemum* of very distinctive appearance. The *head* and *body* are piceous, as are the *antennae*. The labrum, genae, mouth-parts and *legs* are yellowish brown, with the exception of the posterior tibiae and tarsi, which are fuscous. *Spurs* 1, 4, 4. The *anterior wing* is dark brown, with moderately dense dark brown pubescence. In the radial area, from above the base of the discoidal cell to the wing margin, is a bright

patch of golden-yellow hairs. *Posterior wing* smoky brownish, with sparse brown pubescence.

Length of anterior wing, 10·5 mm.

Australia : Queensland, National Park, 2000 ft., 19.xii.1921, 1 ♀, R. J. Tillyard.

This species is rather more hairy than is usual in the genus, and the pattern of the anterior wing and the coloration of the legs and mouth-parts contrasting with the rest of the body should render this insect easily recognisable. It is solely my dislike for erecting new species on single examples of the female sex which deters me from giving this species a name.—D. E. K.]

Subfam. **HYDROPSYCHINAE** Ulmer.

Ulmer, 1903, *Abh. Naturw. Ver. Hamburg*, **18** : 112.
Ulmer, 1907, *Gen. Insect.*, **60a** : 167.

Spurs generally 2, 4, 4 ; in *Smicridea* 1, 4, 4. *Antennae* slender, about as long as anterior wing, in male longer than female. *Maxillary palpi* with very short basal joint ; second in comparison very long ; third and fourth about equal ; fifth as long as the first four together. Labial palpi with two short joints and the third longer. Terminal joints of both palpi flexible. *Middle legs* of female often dilated. Claws of the male often abnormal ; in *Hydropsyche* the outer claw of at least the anterior leg obscured by a tuft of black bristles.

Anterior wing always with a closed discoidal cell. Fork no. 1 always present, generally also all the other forks. Median cell always present. An additional costal cross-vein sometimes present. *Posterior wing* generally with a closed discoidal cell, often also with a closed median cell. Fork no. 1 present or absent ; forks nos. 2, 3 and 5 always present.

Abdomen often with a lateral filament arising from each side of the fifth segment, and in some genera there are also, in the male abdomen, two pairs of internal reticulated sacs.

Key to Genera.

1. Median cell in posterior wing open . . . . . 2.
–. Median cell in posterior wing closed . . . *Hydropsyche* Pictet (p. 316).
2. Fork no. 2 in both wings (or at least in the posterior wing) with a footstalk . 3.
–. Fork no. 2 in both wings sessile (except *Sciops spinata* Banks) . . . 4.
3. Spurs 1, 4, 4. Male abdomen with internal, reticulated, membranous sacs *Smicridea* McLachlan (p. 326).
–. Spurs 2, 4, 4. Male abdomen without such internal sacs *Asmicridea* gen. n. (p. 333).
4. Anterior wing broad ; abdomen with a pair of long lateral filaments, and in the male with two pairs of internal, reticulated sacs *Diplectrona* Westwood (p. 336).
–. Anterior wing not particularly broad ; abdomen without a pair of long lateral filaments and without internal reticulated sacs in the male . . . . 5.
5. Sc and R confluent before the wing margin. *Cheumatopsyche* Wallengren (p. 323).
–. Sc and R separate to the wing-margin, although there may be a cross-vein between them . . . . . 6.
6. Maxillary palp with third joint about twice as long as second *Sciops* McLachlan (p. 347).
–. Maxillary palp with third joint about as long as second *Austropsyche* Banks (p. 351).

[In the case of *Sciops* the characters given are based on the type species (*S. unicolor* McLachlan), since Banks' species are known to me only from literature.—D. E. K.]

Hydropsyche Pictet.

Hydropsyche Pictet, 1834, *Recherch. Phryg.* : 199.
Hydropsyche Ulmer, 1907, *Gen. Insect.*, 60a : 169.

Spurs, 2, 4, 4. *Maxillary palpi*, first joint short, second longer, third short, nearly triangular, fourth slightly longer than the third, fifth as long as the others united ; labial palpi, first and second joints short and triangular, third slightly longer than the two united. The *antennae* are characterized by a slightly elevated and blackened ridge, winding spirally round the joints, becoming indistinct towards the apex. *Anterior wing* with apical forks nos. 1, 2, 3, 4 and 5 present ; discoidal cell short and broad. *Posterior wing* with forks nos. 1, 2, 3 and 5 present, no. 1 always small, discoidal cell always closed ; median cell present. In the anterior tarsus of the ♂ one of the claws is shrouded in a dense mass of hairs. Intermediate tibiae and tarsi of the ♀ flattened and dilated. Oculi of the ♂ sometimes larger than those of the ♀. In the ♂ *genitalia* there is always a strongly chitinized prolongation of the ninth tergite and a pair of slender, two-jointed inferior appendages. Penis generally prominent, sometimes with lateral, angular projections before the apex.

Type species.—*Hydropsyche guttata* Pictet, 1834.

KEY TO SPECIES OF *Hydropsyche*, MALES.

(*Hydropsyche auricoma* Hare and *H. occulta* Hare are omitted from the key owing to lack of detail in the descriptions. The types are no longer in existence).

1. Inferior appendages with the two joints approximately equal in length
H. fimbriata McLachlan (p. 316).
–. Inferior appendages with the terminal joint definitely shorter than basal joint . 2.
2. Dorsal plate from the side with a deep rounded excision on its upper margin at the base . . . . . *H. colonica* McLachlan (p. 318).
–. Dorsal plate from the side with the upper margin more or less straight
H. tepoka sp. n. (p. 320).

Hydropsyche fimbriata McLachlan (fig. 222).

Hydropsyche fimbriata McLachlan, 1862, *Trans. ent. Soc. Lond.*, (3) 1 : 309.
Hydropsyche fimbriata McLachlan, 1868, *Journ. Linn. Soc. Lond. Zool.*, 10 : 213.
Hydropsyche fimbriata McLachlan, 1873, *Ann. Mag. n. H.*, (4) 12 : 41.
Hydropsyche fimbriata Hutton, 1899, *Trans. N. Zeal. Inst.*, 31 : 244.
Hydropsyche fimbriata Hudson, 1904, *N. Zeal. Neur.* : 81–2.
Hydropsyche fimbriata Ulmer, 1907, *Gen. Insect.*, 60a : 171.
Hydropsyche fimbriata Tillyard, 1924, *Trans. N. Zeal. Inst.*, 55 : 301.

McLachlan describes the species as follows :

" *Male and Female.*—Antennae pale ochreous, annulated with dark brown ; eyes varied with brown and black ; head and thorax reddish brown ; abdomen blackish above ; legs ochreous ; anterior wings tawny ochreous, much darker towards the apex, with numerous small pale spots ; several of these are larger towards the base.

on the inner margin elongate pale spots alternate with the dark ground-colour, fringe of the apical margin conspicuously yellowish white ; posterior wings clothed with clay-coloured hairs."

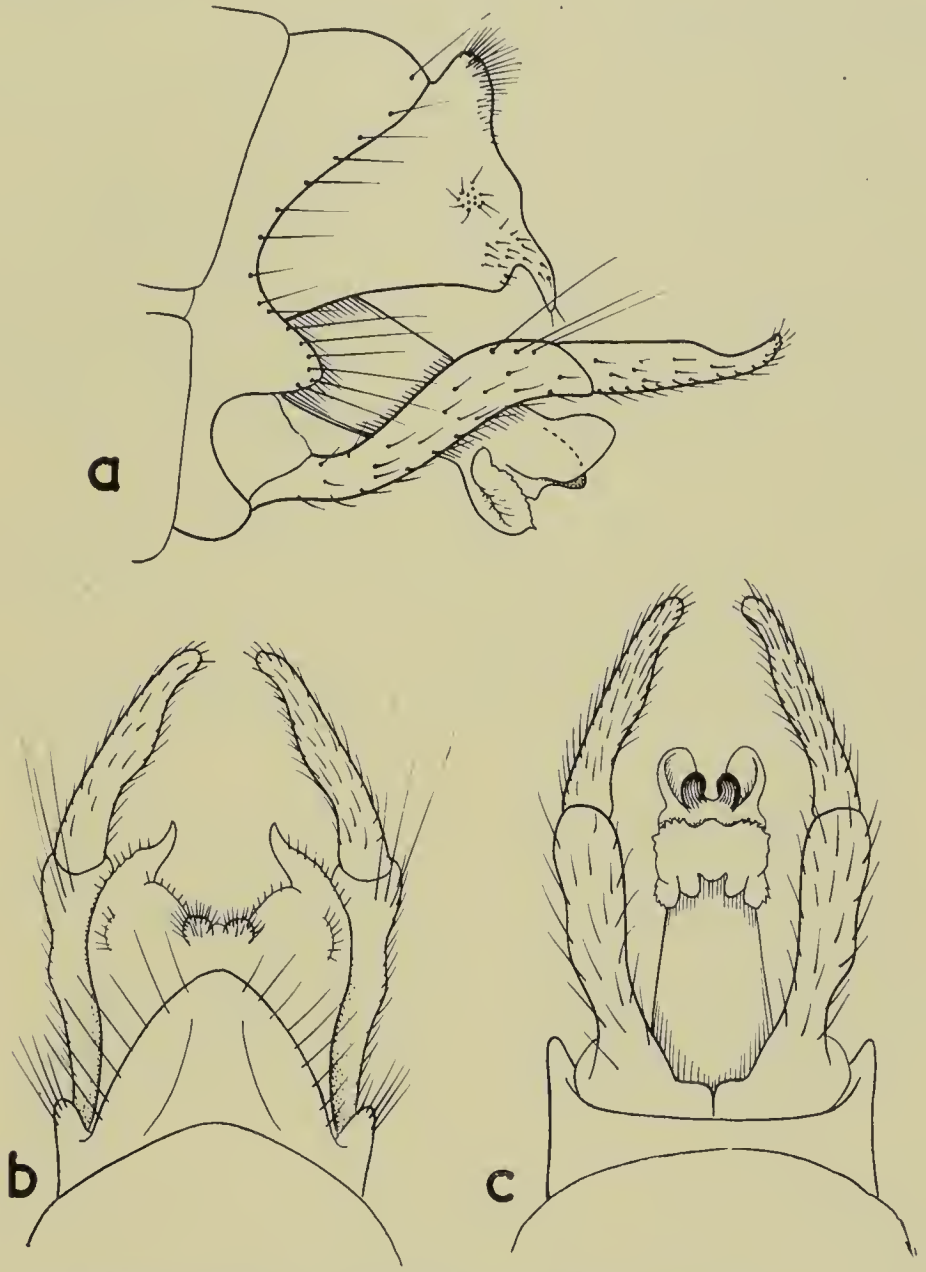

Fig. 222.—*Hydropsyche fimbriata* McLachlan. ♂ genitalia. *a*, lateral ; *b*, dorsal (penis omitted) ; *c*, ventral (dorsal plate omitted).

" Inferior anal appendages in the male with very long terminal joints, which are pointed and curved upwards, approximating at the tips ; penis pale, with a callosity before the apex beneath, apex dark red, tumid."

" Long. corp. 4 lin. ; exp. alar. $10\frac{1}{2}$ lin."

" *Habitat*, New Zealand. In the British Museum."

The *type* has now lost its posterior half so that only *head*, *anterior* and *median legs* remain, together with the *anterior wings*. The figures have been drawn from an example in the McLachlan Collection determined by McLachlan himself and bearing his label.

To McLachlan's description of the *genitalia* I add : The usual elevation of the dorsal surface of the ninth segment is inconspicuous. Dorsal plate, from the side, obliquely truncate with upper angle rounded and thickly clothed with long hairs, lower angle produced downward in a long spine. Side-pieces of the ninth segment strongly produced. Penis with the apex divided in an upper and lower portion, the upper from below displaying two ear-like processes, in front of which is a pair of strongly chitinized nodules with concave inner margins. The lower portion of the apex, from beneath, is seen as a wide plate with strongly serrate distal margin ; lateral angles produced basally in blunt processes. Inferior appendages two-jointed, approximately equal in length. The division between the joints is very obscure and, at times I have been inclined to consider the appendages as single-jointed.

Hudson writes of this species :

" The transformations of this insect probably closely resemble those of the next species (*H. colonica*), and I have often met with larvae and pupae identical in appearance but larger, which would, if they had been successfully reared, most likely have resulted in specimens of *H. fimbriata*."

" The perfect insect appears in November, December and January. It flies at evening dusk in the neighbourhood of water. It is extremely active and difficult to catch, captured specimens frequently without the slightest warning dashing out of the box."

Hydropsyche colonica McLachlan (fig. 223).

Hydropsyche colonica McLachlan, 1871, *Journ. Linn. Soc. Lond. Zool.*, 11 : 131, pl. 14 fig. 16.
Hydropsyche colonica McLachlan, 1873, *Ann. Mag. n. H.*, (4) 12 : 41.
Hydropsyche colonica Hutton, 1899, *Trans. N. Zeal. Inst.*, 31 : 245.
Hydropsyche colonica Hudson, 1904, *N. Zeal. Neur.* : 82–3, pl. 11, fig. 7.
Hydropsyche colonica Ulmer, 1907, *Gen. Insect.*, fasc. 60a : 171.
Hydropsyche colonica Tillyard, 1924, *Trans. N. Zeal. Inst.*, 55 : 301.

McLachlan describes the species as follows :

" Blackish. *Head* and *prothorax* densely clothed with hoary hairs : antennae fuscous, with indistinct paler annulations, and with the oblique blackish streak on each joint of the basal portion usual in species of this genus. *Mesothorax*, *metathorax* and *abdomen* black or blackish, the latter with a broad whitish line along each side, most conspicuous in the ♀. *Palpi* and *legs* testaceous or yellowish. In the ♂ the terminal dorsal abdominal segment bears in its middle a nearly vertical short lobe, which is emarginate or notched : appendices testaceous or yellowish ; from under the last dorsal segment proceeds a shining, semitransparent yellowish lobe, which is deeply excavated in its middle above, the sides deflexed, and the apex angular ; app. sup. apparently wanting ; app. inf. long, cylindrical, directed upwards, and forcipate, the second joint being short, thick and subobtuse, clothed with short golden pubescence, and with two or three longer blackish hairs ; penis cylindrical,

directed upward, gradually becoming thinner to the glans, which is dark reddish testaceous and deeply bifid, bearing beneath two broad, claw-shaped, acute teeth or hooks, which curve upward. In the ♀ the apex of the last dorsal segment is bifid, and from beneath it proceeds an elongato-quadrate testaceous lobe, from each side of which springs a long hair ; sides oblique, with a broad obtuse valve on either side."

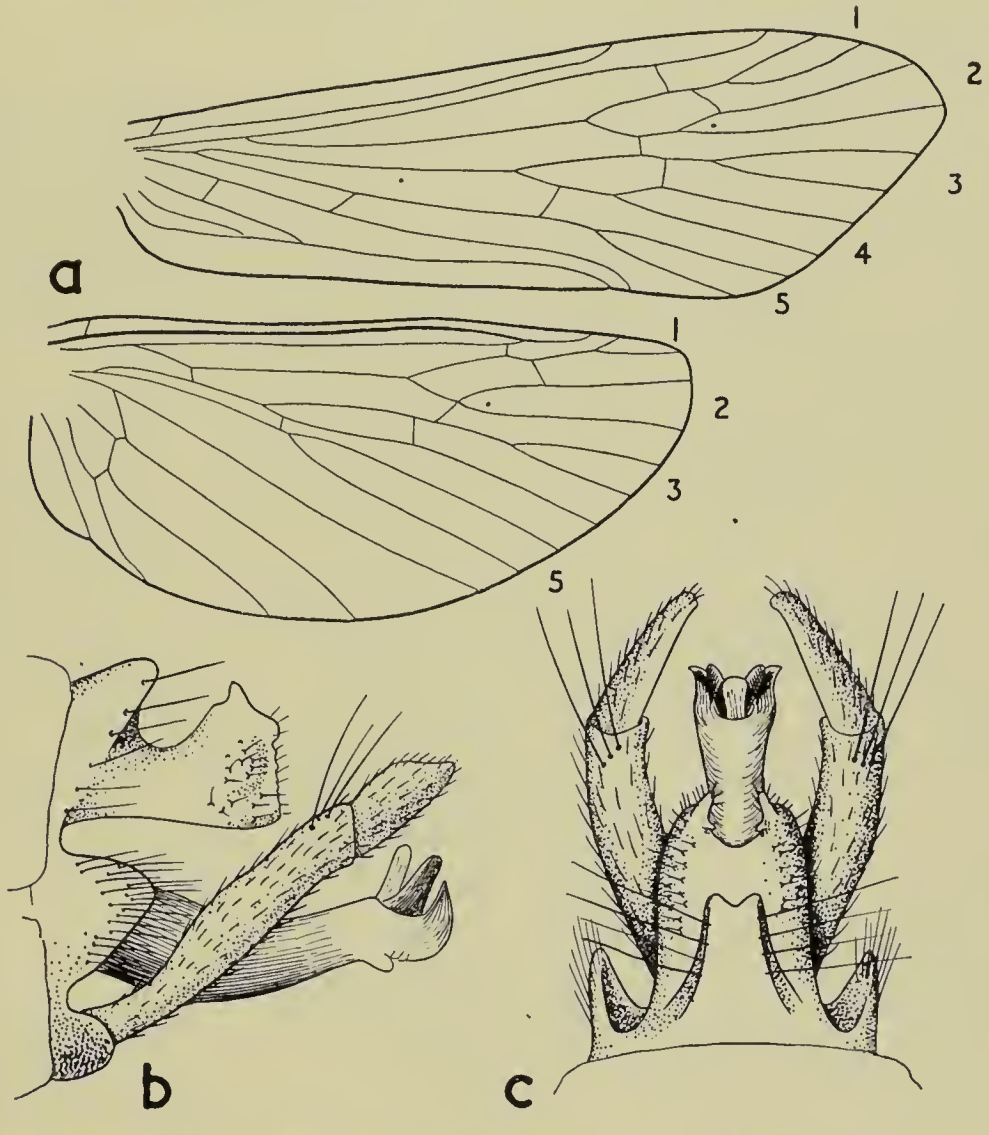

Fig. 223.—*Hydropsyche colonica* McLachlan. ♂. *a*, wings ; *b*, genitalia, lateral ; *c*, dorsal.

"*Anterior wings* long and narrow (broader in the ♀), greyish yellow, thickly reticulated with dark grey, and with several short, almost blackish, streaks on the inner margin,which alternate with yellowish spaces (the grey reticulations and spots are caused by the colour of the pubescence). *Posterior wings* clothed with rather dense smoky pubescence, subhyaline, the veins darker."

" Long. corp. ♂ 3 lin. (= 7 mill.), ♀ $3\frac{1}{2}$ lin. (= $7\frac{3}{4}$ mm.) ; exp. alar. ♂ $10\frac{1}{2}$ lin., = 22 mm.) ; ♀, $13\frac{1}{2}$ lin. (= 28 mm.)."

" *Hab.* Nova Zealandia (Christchurch, Canterbury, *Fereday*)."

Type ♂, paratype, ♀, in the British Museum (N.H.).

The structure of the apex of the penis is left a little vague in McLachlan's description. From above, the apex is scooped out and in the resulting cavity is a semi-transparent, rounded dorsal lobe with two strongly chitinized processes beneath. The lower part of the scoop forms the "two broad, claw-shaped, acute teeth or hooks" as described by McLachlan.

Hudson writes of *H. colonica*:

"The larva of this insect inhabits the streams throughout the entire year, but is commonest in the early spring, when full-grown individuals are often most abundant. It frequents the most rapid portions of the stream, where the water is clear and bright. It generally lives in a loosely constructed gallery composed of leaves, twigs and fairly large pebbles, attached by means of fragile silk to the under-surface of a large boulder. This larva is able to cling with great tenacity by means of its strong anal prolegs—a faculty which is no doubt very serviceable to the insect, whilst making its way about in the rushing torrents, which it often frequents, and there it is sometimes found crawling about without any protection."

"The length of the larva when full grown is about $\frac{3}{4}$ inch. The head is round, much flattened above, dark brown, and horny with the surface very rough. The prothorax is small, cylindrical, and horny throughout. The meso- and meta-thorax are slightly larger, and furnished with dark-brown horny plates on the dorsal surface. The segments of the abdomen are stout, rather soft, and dull greenish-brown in colour. There are two rather elongate appendages at the posterior extremity of the larva, each furnished with a very strong hook, and a conspicuous tuft of long brown bristles. The under-side of the mesothorax is furnished with two branching white filaments. The metathorax and the first seven segments of the abdomen are each furnished, on the under surface, with four branching white filaments. The last segment but one has two filaments, and the terminal segment two brushes of brown bristles, in addition to the above described terminal appendages. The anterior pair of legs are very short and stout; the other two pairs also short and rather slender."

"This larva is a favourite article of food with the trout, and as it occurs in large numbers during the winter, and is full grown in very early spring, it must be an important item in the dietary of that fish."

"When full grown this larva constructs a cocoon of rather large stones, loosely joined together with silk, but firmly attached to a boulder in the bed of the stream. The pupa is simply enclosed in this cocoon, and is not encased in any inner horny case. The perfect insect appears in December and January, and is often extremely abundant after dark, when large numbers may be observed either flying over the stream or running with great agility over the stones and herbage near the banks."

Tillyard adds that it—

"is easily the commonest caddis-fly in New Zealand, and is sometimes a perfect nuisance in hydro-electric works, being attracted to the light in countless thousands at night, and getting into the clothes, eyes, and hair of the workmen."

Hydropsyche tepoka sp. n. (fig. 224).

Insect large. *Wings* with the usual *Hydropsyche* irrorations. The figures have been made from balsam preparations.

Genitalia, ♂.—From above, the ninth segment bears on its dorsal surface

above the dorsal plate, a large, triangular elevation, apex produced and excised. Distal margin of the dorsal plate, from above, widely excised. From the side, there is a right-angled excision beneath the elevated part of the segment. The

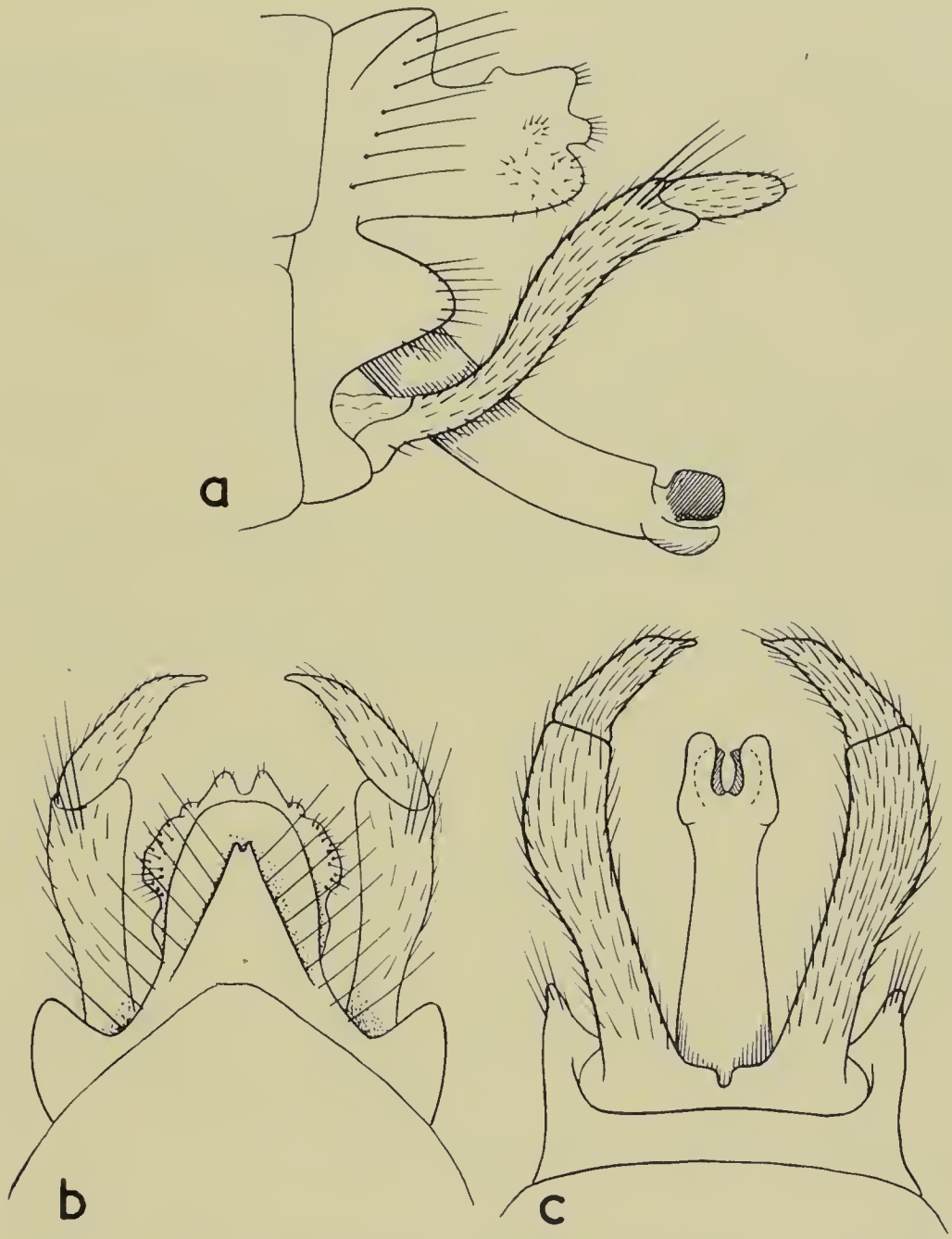

Fig. 224.—*Hydropsyche tepoka* sp. n. ♂ genitalia. *a*, lateral; *b*, dorsal; *c*, ventral (dorsal plate omitted).

dorsal plate has a small, rounded knob at about the centre of its distal margin and another, still smaller, occurs about midway along the upper margin. Penis slightly constricted before the apex, which is divided in two pairs of short,

rounded nodules, the upper strongly pigmented and slightly wider, from the side, than the lower, which is transparent. No angular projection before the apex. Inferior appendages with the apical joint short and produced to a slender apex.

Length of the anterior wing, ♂, 12 mm.; ♀, 18 mm.

New Zealand: L. Te-ka-po, 20.xii.1899, 1 ♂, G. V. Hudson: Canterbury, L. Te-ka-po, 5 ♂, G. V. Hudson (McLachlan Collection); R. Te-ka-po, 24.i–3.ii.1922, 7 ♂, 1 ♀, J. Henderson.

Type, ♂, is a balsam preparation (R. Te-ka-po, J. Henderson). The type slide has an additional abdomen mounted with it to show the lateral aspect. *H. tepoka* differs from *H. colonica* in the absence of a deep rounded excision of the upper margin of the dorsal plate, as seen from the side, and in the more pointed apices of the inferior appendages.

Hydropsyche auricoma Hare.

Hydropsyche auricoma Hare, 1909, *Trans. N. Zeal. Inst.*, 42 : 32.
Hydropsyche auricoma Tillyard, 1924, *Trans. N. Zeal. Inst.*, 55 : 301.

Hare describes the species as follows:

"Brownish-fuscous. Antennae brownish-fuscous, segments tipped with pale ochreous. Head, prothorax and mesothorax densely clothed with pale-golden hairs. Forewings greyish-yellow, with darker reticulations; four series of brownish-fuscous marks tending to form transverse bands. Hindwings greyish, slightly iridescent. Legs pale ochreous. Abdomen brownish-ochreous, darker above.

"Length of body 5 mm. Expanse of wings 15 mm.

"Habitat. N. Zealand, Wellington."

I am unable to recognize this species from the description, and Mr. Hare informs me that the *type* has been destroyed by insect pests.

Hydropsyche occulta (Hare).

Hydrobiosis occulta Hare, 1909, *Trans. N. Zeal. Inst.*, 42 : 32–33.
Hydropsyche occulta Tillyard, 1924, *Trans. N. Zeal. Inst.*, 55 : 301.

Hare deseribes the species as follows:

"♂ dark brown. Antennae rather longer than forewings, dark brown, almost unicolorous; the basal joint with the face and prothorax, clothed with golden-brown hairs. Forewings dark brown with dense golden-brown pubescence. Hindwings with pubescence scantier and dark brown. Legs light ochreous-brown. Abdomen without ventral teeth. Penis yellow; inferior appendices directed upwards and curved so as to meet over the extremity of the abdomen."

"Length 6 mm. Expanse of wings 14 mm."

"♀ differs from ♂ as follows: antennae not longer than forewings: pubescence of forewings almost wholly brown."

"Length, 6 mm. Expanse of wings, 17 mm."

"Hab. N. Zealand, Wainuiomata River, Wellington."

Type destroyed by pests in Mr. Hare's collection.

The species is not separable by the above deseription from other species in the genus.

Cheumatopsyche Wallengren.

Cheumatopsyche Wallengren, 1891, *K. Sv. Vet. Akad. Handl.*, (10) **24** : 142–143.
Cheumatopsyche Ulmer, 1907, *Gen. Insect.*, **60a** : 169.

Closely resembling *Hydropsyche*. *Antennae* without oblique black lines. *Maxillary palpi*, basal joint very short ; second long ; third shorter than the second but longer than the fourth ; fifth about as long as the first three united. *Anterior wing* as in *Hydropsyche*. In the *posterior*, the median cell is wanting and the costal margin is distinctly excised at about the level of the distal end of the discoidal cell ; generally in this wing, fork no. 1 is wanting. *Spurs*, 2, 4, 4. Second joint of the inferior appendage in the ♂ somewhat claw-shaped.

Type species.—*Hydropsyche lepida* Pictet, 1834.

Key to Species of *Cheumatopsyche*.

1. Penis from above terminating in two pairs of processes ; apical margin of ninth tergite produced in a single rounded lobe . *C. philpotti* (Tillyard) (p. 325).
–. Penis from above terminating in one pair of processes ; apical margin of ninth tergite produced in a pair of rounded lobes with a V-shaped excision between them . . . . . *C. modica* (McLachlan) (p. 323).

Cheumatopsyche modica (McLachlan) (fig. 225).

Hydropsyche modica McLachlan, 1871, *Journ. Linn. Soc. Lond. Zool.*, **11** : 133–134, pl. 4, fig. 18.
Hydropsyche modica Ulmer, 1907, *Gen. Insect.*, **60a** : 171.
Hydropsychodes modica Ulmer, 1916, *Ark. f. Zool.*, **10** : 11–13, figs. 15–17.

McLachlan describes the species as follows :

" Fuscous. *Head*, *prothorax*, and two impressed lines on the *mesonotum* densely clothed with golden-grey hairs : antennae testaceous, annulated with brown : palpi testaceous. *Legs* testaceous ; a black dot on each of the trochanters. *Abdomen* blackish ; middle of terminal margin of last dorsal segment somewhat produced, obsoletely notched : from beneath this segment proceeds a short, truncate, testaceous lobe : app. inf. testaceous ; the basal joint long, cylindrical, pubescent, gradually clavate at its tip ; second joint short, thin and spiniform, slightly curved : penis slender, cylindrical, the glans oval and capitate, unarmed."

"*Anterior wings* narrow, pale yellow, without markings ; veins testaceous. *Posterior wings* greyish subhyaline, the costal edge testaceous ; veins fusco-testaceous."

" Long. corp. $2\frac{1}{2}$ lin. (= $5\frac{3}{4}$ mill.) ; exp. alar. $9\frac{1}{2}$ lin. (= 20 mill.)."

" *Hab.* Australia (Victoria, *Edwards*)."

In the *posterior wing* fork no. 1 and the median cell are both wanting, thus placing the species in *Cheumatopsyche* rather than *Hydropsyche*. A further description of the genitalia is here given.

Genitalia, ♂.—Apical margin of the ninth tergite produced in a pair of rounded processes separated by an excision. Beneath them is the quadrate dorsal plate, which is very wide. Apical margin truncate, slightly convex, with the apical angles produced in slightly inwardly directed processes ; a rounded wart towards the base of each process. Penis with the apex widely furcate, each fork somewhat twisted, with shelf-like lateral projections. From

the side it is deeply excised on its lower margin before the apex. Inferior appendages with the apex of the basal joint considerably dilated on its upper margin as seen from the side ; terminal joint short and somewhat claw-shaped.

Type, ♂, in the British Museum (N.H.). Additional material in the British Museum (N.H.) collected by Mr. R. E. Turner.

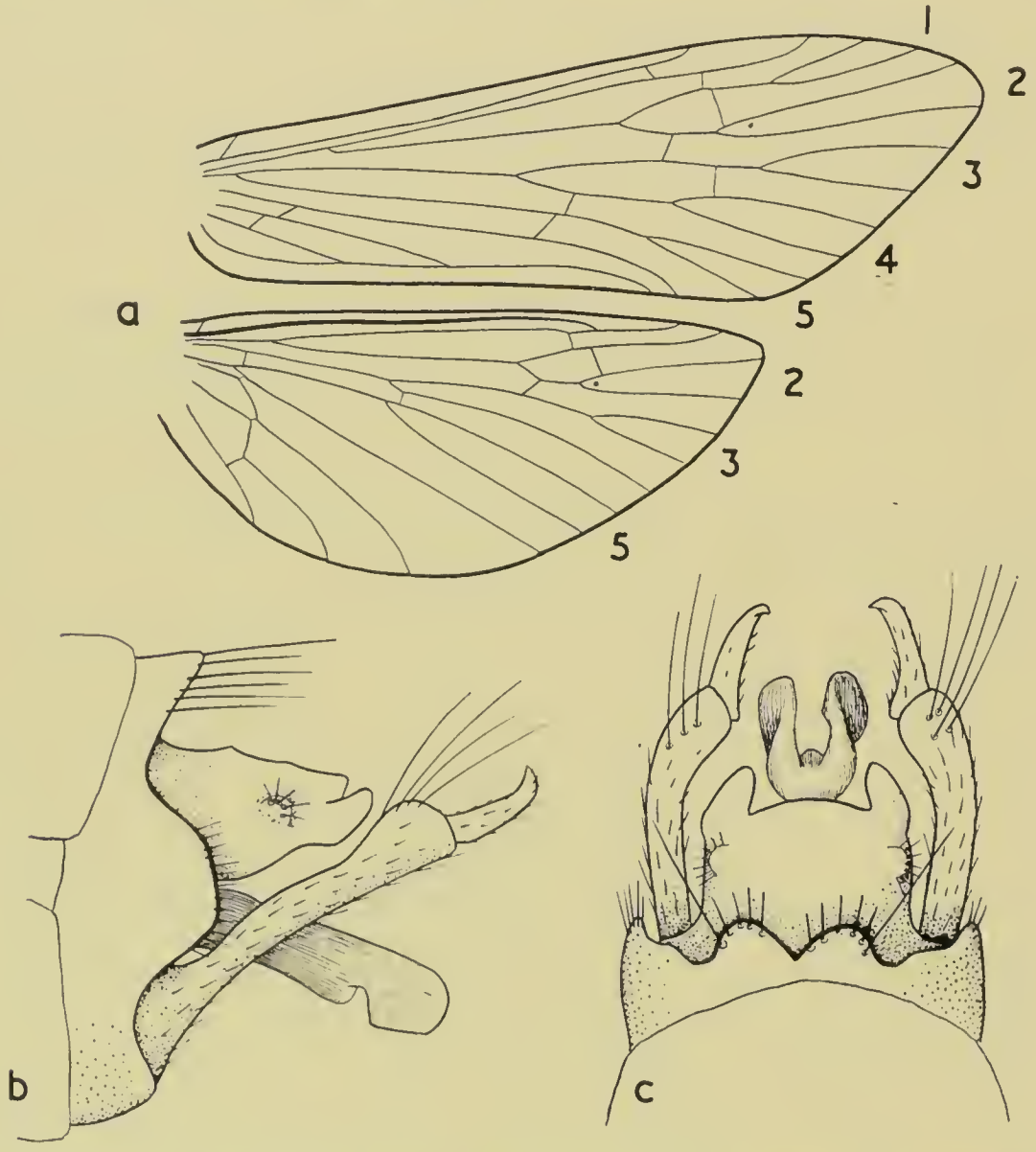

Fig. 225.—*Cheumatopsyche modica* (McLachlan). ♂. *a*, wings ; *b*, genitalia, lateral ; *c*, dorsal.

Australia : S.E. Queensland, Tambourine Mts., 19–26.iv.1935 ; N. Queensland, Kuranda, 1100 ft., 3.v–24.vii.1913, Queensland, Maleny. New South Wales, Hampton, i.1918, R. J. Tillyard ; and in the C.S.I.R. Collection, Canberra, from Queensland, Eidsvold and F. C. T., Canberra.

Cheumatopsyche philpotti (Tillyard) (fig. 226).

Hydropsyche philpotti Tillyard, 1924, *Trans. N. Zeal. Inst.*, 55 : 301–302, pl. 19, fig. 8 ; text-fig. 16.

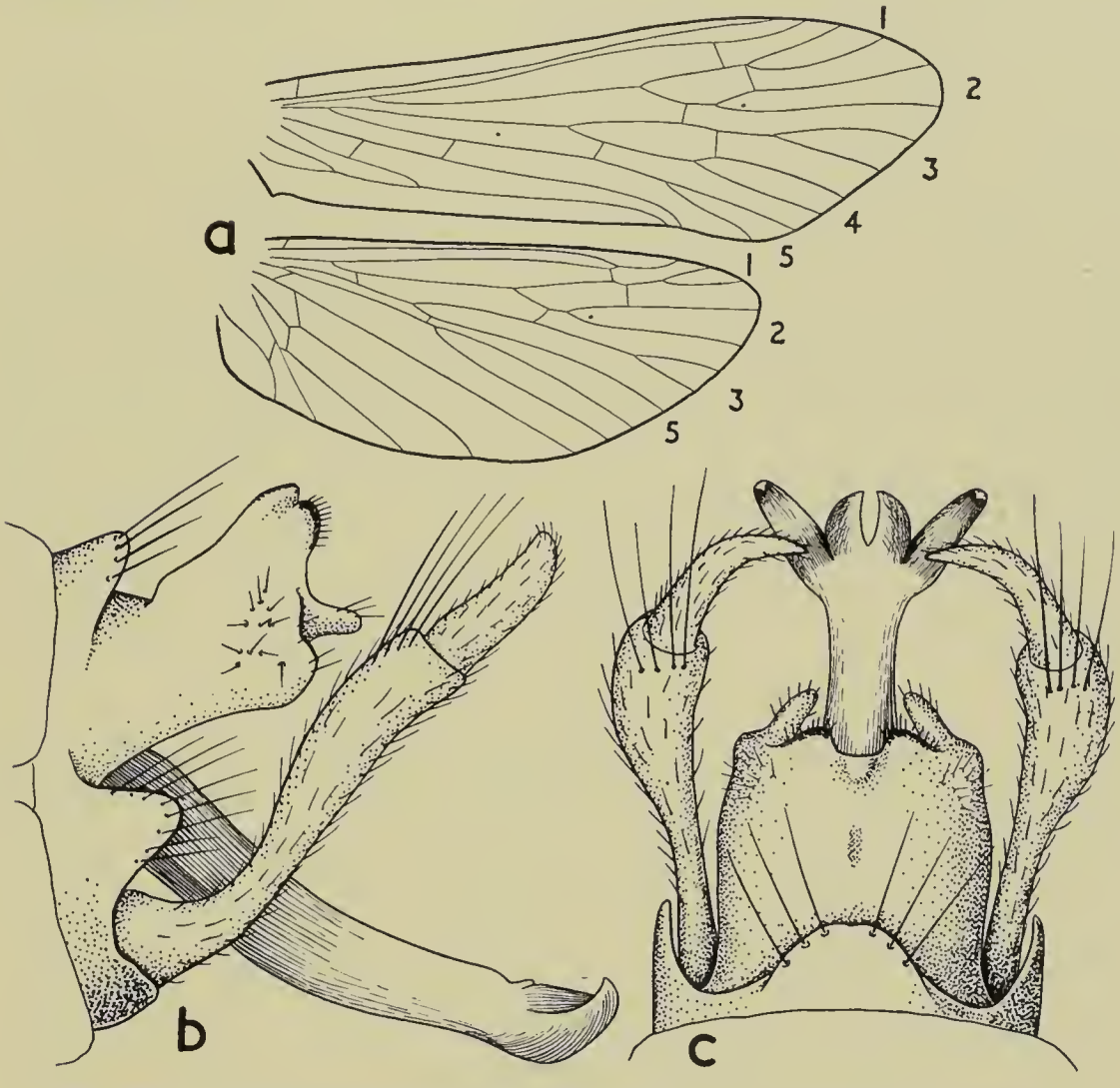

Fig. 226.—*Cheumatopsyche philpotti* (Tillyard). ♂. *a*, wings ; *b*, genitalia, lateral ; *c*, dorsal.

Tillyard describes the species as follows :

" ♂. Total length, 5 mm. ; forewing, 8·3 mm. ; expanse, 18 mm."

" *Head*, *thorax* and *abdomen* entirely dull blackish ; eyes black ; antennae dull black, not quite as long as forewing. Appendages black with exception of the very prominent penis, which is semitransparent yellowish-brown. Legs dull-brownish."

" *Wings*.—Forewing black in life, fading to deep fuscous in the dried specimen ; scattered over wing, but especially on apical half, are numerous small rounded spots of a slightly paler colour, not at all prominently marked, and a more conspicuous pale-yellowish patch on posterior margin at end of Cu_2 and 1A. Cu_1 a stout vein, strongly marked in black. Hindwing dull fuscous, partially transparent, with

darker venation. Text-fig. 16 shows the very characteristic genital appendages of this species, in which the gonapophyses are held vertically upright, while the remarkably shaped penis projects ontwards horizontally, carrying a strong terminal lobe from which projects a slender bifid spine."

"♀ unknown."

"*Types.*— Holotype male and three paratype males, Dun Mountain, Nelson, N.Z., 3000 ft. (8th January, 1922, A. Philpott)."

Type, ♂, presumably in the Cawthron Institute Collection, paratypes from the Tillyard Collection in the British Museum (N.H.).

To this may be added a further description of the genitalia.

Genitalia, ♂.—Apical margin of the ninth tergite produced to make an upper triangular projection from beneath which proceeds the dorsal plate. This is very large, quadrate from above, apical margin excised at its centre, the angles of the excision slightly produced, rounded and darkened. From the side the distal margin of the plate is deep and rather serrate, with a short process arising towards the lower angle. From this aspect there is a very deep excision between the plate and the upper triangular projection. Penis prominent, terminating from above in a pair of outstretched and slightly upturned hooks, with a pair of short, stout, triangular, claw-like processes arising between them. There is no spine to the penis as indicated by Tillyard in his description and shown in his figure. Inferior appendages two-jointed, apical joint incurved and very acute. Side-pieces of the ninth segment strongly produced.

I am of opinion that the spine on the penis to which Tillyard referred is an adventitions, lepidopterous scale, accidently lodged between the apical processes. I am confirmed in this view by finding a specimen of *philpotti* in the Tillyard Collection bearing such a scale in exactly the same position as shown in Tillyard's figure. This specimen bears a similar label to that of the type, and it would almost appear that Tillyards' figure was drawn from this example were it not that Tillyard states that the abdomen of the type was cleared in KOH. My figures have been drawn from the example to which I refer and, needless to state, the scale became detached when the abdomen was cleared for the purpose of this description.

The absence of a median cell in the posterior wings places the species in *Oeumatopsyche* rather than in *Hydropsyche*, in which it was described.

Smicridea McLachlan.

Smicridea McLachlan, 1871, *Journ. Linn. Soc. Lond. Zool.*, 11 : 134–136.
Smicridea Ulmer, 1907, *Gen. Insect.*, 60a : 175.

McLachlan describes the genus as follows :

"*Head* moderate, densely clothed with pubescence ; vertex rounded, the posterior margin with a large elongate tubercle on each side : front, below the antennae, strongly developed and somewhat overhanging, truncate or emarginate : eyes moderate : ocelli absent : antennae not longer than the wings, very slender, the basal joint short, and but little thickened, each joint of the thread slightly swollen internally at its apex, thus giving an indistinctly serrate appearance ;

maxillary palpi with the first joint very short and concealed under the front of the head ; second and third joints short, subequal, somewhat triangular ; fourth joint longer and more cylindrical ; fifth very long and slender, equalling the others united : labial palpi very small. *Mesothorax* short and robust. *Abdomen* short ; the males provided with well-developed app. sup. and inf. *Legs* moderate, pubescent, the tibiae and tarsi of the intermediate pair only very slightly dilated in the female ; anterior tibiae with only one, short, robust, apical spur ; intermediate and posterior tibiae each with two pairs of long and more slender subequal spurs."

"*Anterior wings* long, moderately narrow, of nearly uniform width throughout, the apical portion being very little dilated, apex very obtuse, the apical margin oblique and very slightly rounded, costal and inner margins nearly straight ; clothed with short dense pubescence ; longitudinal veins rather strong ; transverse veinlets very indistinct, and for the most part transparent ; subcosta and radius straight, running nearly parallel, both reaching the costa far before the apex ; apical forks 1, 2, 3, 4 and 5 all present, 4 very long, 1 and 2 not reaching the anastomosis ; discoidal cell small and narrow, closed ; median cell longer and broader ; sutural area very broad, owing to the inner margin not being concave. *Posterior wings* one-fourth shorter than the anterior, much broader ; costal margin slightly concave and sinuate ; apex broadly rounded ; subcosta short, extending only to the middle of the costal margin, or slightly beyond ; radius running very close to the subcosta, but becoming confluent with the first apical sector just after the insertion of the veinlet closing the discoidal cell ; apical forks 2, 3 and 5 present."

Type species.—*Smicridea fasciatella* McLachlan, 1871 (by subsequent designation of Ross, 1944).

To McLachlan's description I would add that the genus is allied to *Diplectrona*. In both genera there are, within the abdomen of the male, rounded, reticulated structures which Eltringham considers are connected with the tracheal system. In a previous paper I placed two species, *grisea* and *edwardsi*, in *Smicridea*, but in both, the abdominal structures are absent. I have therefore considered it advisable to erect a new genus to take them.

In the Australian species of the true *Smicridea* the subcosta of the posterior wing is much longer than is indicated in McLachlan's generic description ; the reticulated structures in the male abdomen are present.

Tillyard refers to the genus *Smicridea* (to which must be added *Asmicridea*) under the popular name of the Snow-flake Caddis-flies. He says :

" The males have pure white wings, sometimes with dark markings, and fly in clouds on the mountain streams in the late afternoon, rising and falling rhythmically and giving the appearance of a miniature snowstorm. The females are dull brownish insects which seldom escape from the water ; for, as soon as one emerges from the pupal shell, the whole swarm of males descends upon her, and she is often drowned in the act of releasing her eggs."

Key to Species of *Smicridea*.

The species *parva* and *ulmeri* of Banks are insufficiently known to me and are omitted from the key.

1. Joints of the inferior appendages of about equal length ; fore wing of ♂ yellowish, with dark brown patches . . . . . *S. australis* Ulmer (p. 328).
–. Basal joint of inferior appendage much longer than terminal joint ; anterior wing ♂ silky-white, with brownish costal border . . *S. parvula* sp. n. (p. 330).

Smicridea australis Ulmer (fig. 227).

Smicridea australis Ulmer, 1908, in Michaelsen and Hartmeyer, *Faun. Südwest Austr.*, 2 : 35, figs. 13–15.
Smicridea australis Ulmer, 1916, *Ark. f. Zool.*, 10 : 15.
Smicridea australis Mosely, 1933, *Ann. Mag. n. H.*, (10) 12 : 216, 220, pl. 8, fig. 3.

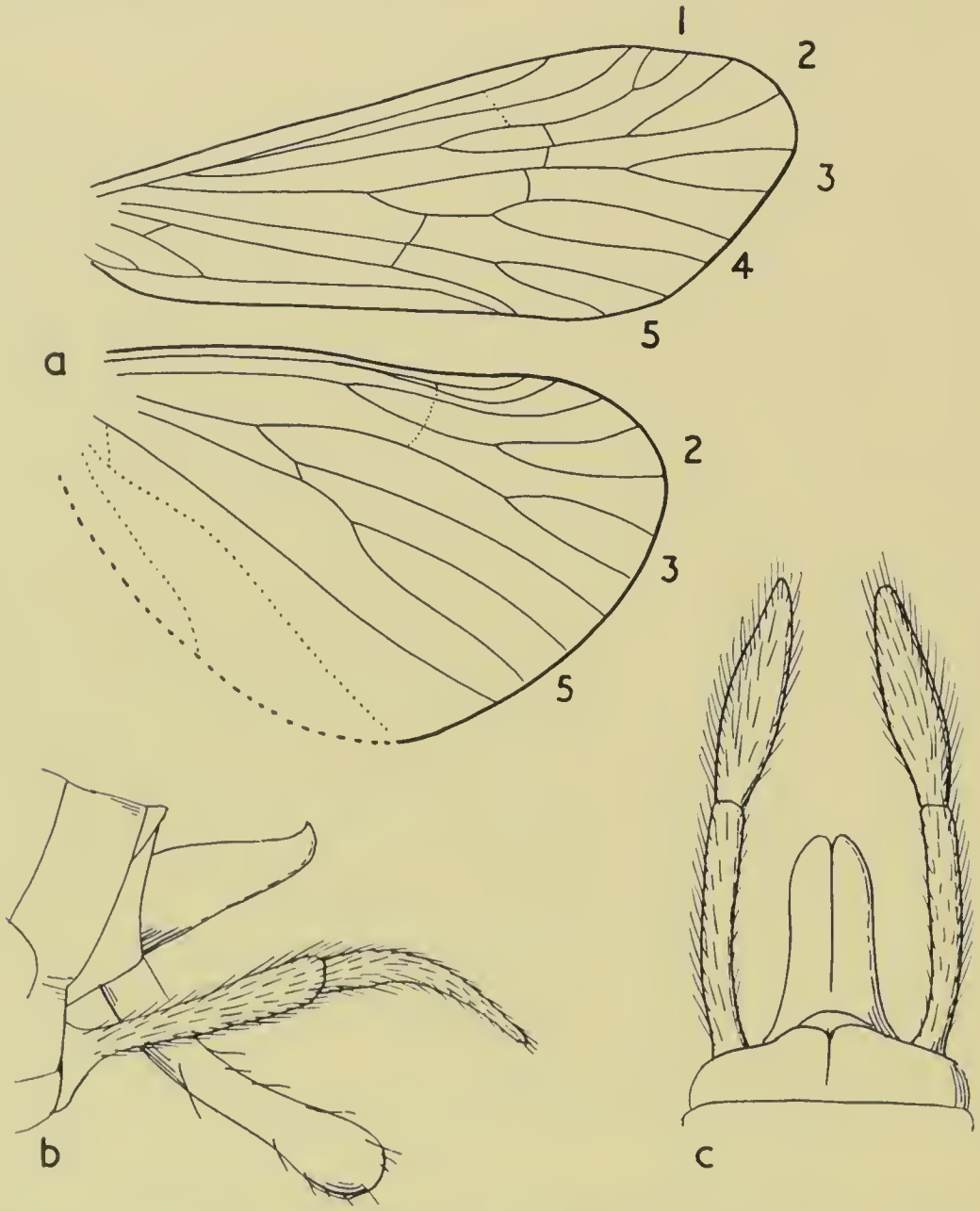

Fig. 227.—*Smicridea australis* Ulmer. ♂ (after Ulmer). *a*, wings ; *b*, genitalia, lateral ; *c*, dorsal.

The following is a translation of Ulmer's description :

The whole body dark brown ; mesothorax black-brown. *Head*, *pronotum* and fore part of the *mesonotum* with dense and long yellowish grey or white

hairs. *Antennae* slender, with the basal joint dark ochraceous and annulated with dark brown, the remaining joints brown. *Maxillary palpi* dark brown.

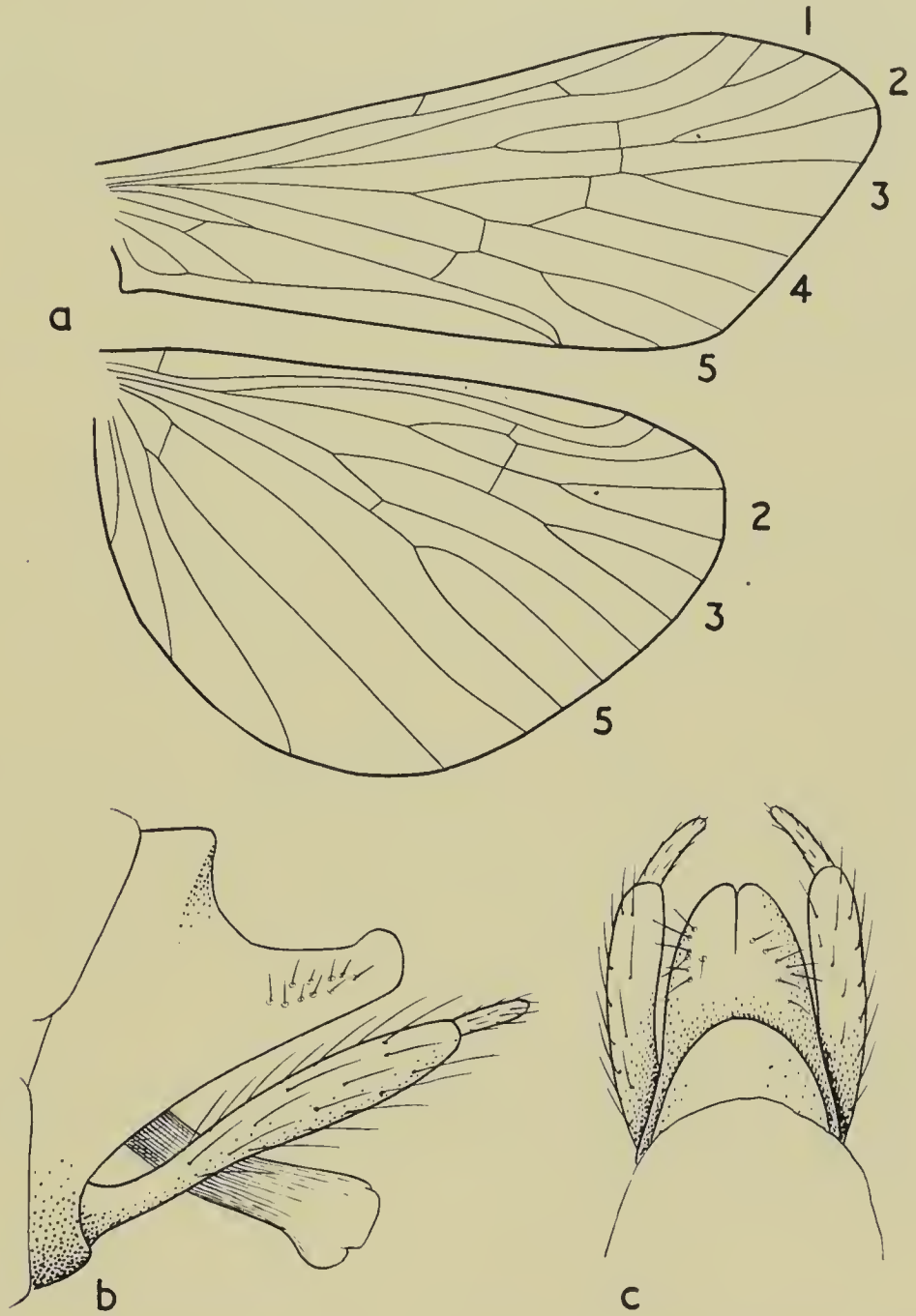

Fig. 228.—*Smicridea parvula* sp. n. ♂. *a*, wings; *b*, genitalia, lateral; *c*, dorsal.

Fore *legs* and coxae brown, tibiae of middle and hind legs light brown. Tibiae and tarsi of the median legs sometimes, and those of the hind legs always whitish. Hind legs with long, silky white hairs. *Spurs* 2, 4, 4 (1, 4, 4, M.E.M.),

inner spur longer than the outer. *Fore wing* yellowish, with close pubescence, with dark brown patches particularly at the pterostigma, at the centre of the wing and in the apical cells. *Hind wing* very broad and entirely white. Fringes of fore wing yellow, dark brown at the pterostigma ; those of the hind wing long and white. In the fore wing distal end of the discoidal cell level with that of the median cell. Discoidal cell of the hind wing closed. All the forks present in the fore wing, but only 2, 3, 5 in the hind wing. *Genitalia* yellowish-grey. Dorsal plate (superior appendages of McLachlan) elliptical, excised at the centre of the apical margin. Penis with globular apex. Inferior appendages with long hair, second joint slender and slightly arched.

Length of body, $3\frac{1}{2}$–4 mm.; of fore wing, 5 mm.; expanse about 11 mm. S.W. Australia : Jarrahdale, 20.ix.1905, 5 examples.

To this I would add that the internal abdominal structures are present, indicating that the species is a true *Smicridea*.

Smicridea parvula sp. n. (fig. 228)

Head with a mass of white hairs between the rather large, chocolate-brown oculi. *Antennae* covered with white hairs, serrate, with narrow, dark brown annulations. *Palpi* and *legs* brown-ochraceous. *Anterior wing* densely covered with a mat of silky white hairs excepting along the costal border as far as the pterostigma, where it is brown-ochraceous with a few very faint brown-ochraceous patches along the apical border. *Posterior wing* white all over. Spurs 1, 4, 4.

Genitalia, ♂.—Apical margin of the ninth tergite strongly produced and rounded. To the lower part of the margin is welded a large plate with the apical margin narrowly excised. In previous descriptions of *Smicridea* species I have followed McLachlan in considering this plate as representing fused superior appendages. Penis with the apex strongly dilated. Inferior appendages two-jointed, basal joint large, apical joint small. Four large, reticulated bodies are contained within the abdomen ; the apical pair round, the basal, oval, these indicating that the species is a true *Smicridea*.

Length of the anterior wing, ♂, 6 mm.

AUSTRALIA : Victoria, Melbourne, 1894, 1 ♂ (*type*) Anderson ; Victoria, Fernshaw, 21.xii.84 1 ♂, 2 ♀ (*ex* McLachlan Coll.).

The species is evidently closely allied to *S. australis* Ulmer. It differs in the form of the inferior appendages, more particularly the second joints, and also, slightly, in the neuration.

Smicridea parva Banks (fig. 229*c*).

Smicridea parva Banks, 1939, *Bull. Mus. Comp. Zool. Harv.*, 85 : 493, fig. 41.

Banks describes the species as follows :

" Head blackish, with white hair and also white hair on the thorax : palpi brownish ; antennae pale, above annulate with dark ; legs pale ; abdomen brown, genitalia pale. Fore wings mostly white in male, usually a large brownish stigmal mark, and sometimes darkened irregularly along tip, and two large spots

(sometimes connected) along hind margin ; in female usually with these large dark spots or almost entirely dark ; hind wings white."

"The fore wings have the venation similar to others ; however the fork one goes as far back as fork two, forks two and three about equal, fork four very long, reaching back a little further than five, discal cell slender, nearly six times as long as broad, cross-vein from cubitus to anal very oblique backwards, and before the cross-vein from cubitus to radius. Male genitalia have the claspers much like *S. edwardsi*, the apical part much shorter than basal part, very slender, a little curved, but not tapering

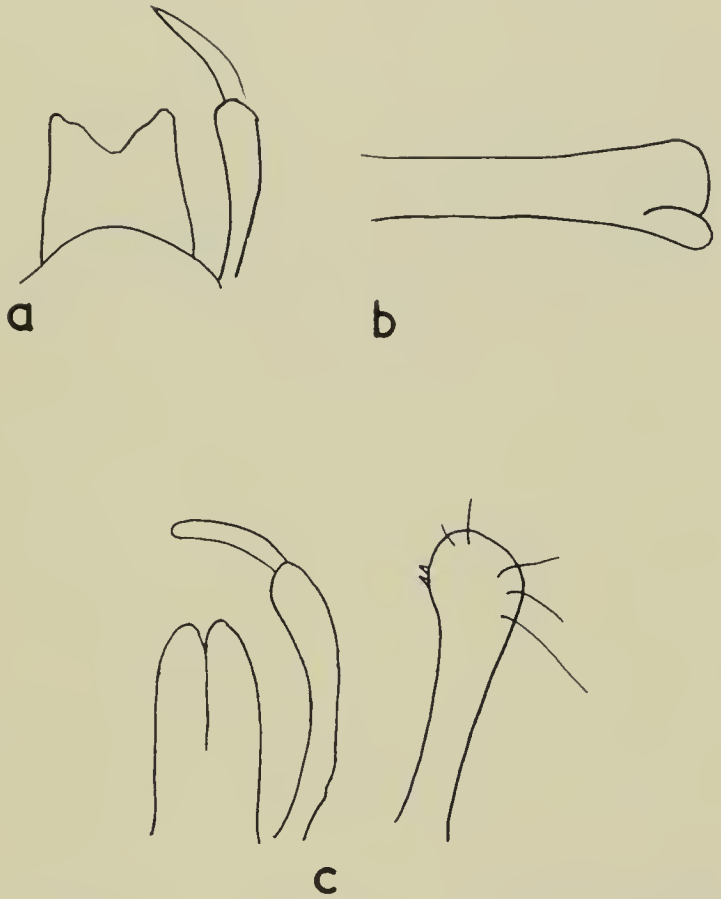

Fig. 229.—*Smicridea* spp. ♂ (after Banks). *a–b*, *ulmeri* Banks, genitalia. *a*, "superior plate" and clasper dorsal ; *b*, penis, lateral. *c*, *parva* Banks, genitalia, "superior plate," clasper and penis.

to tip as in *S. edwardsi* ; the basal piece (from side) has the tip scarcely upturned. The penis is enlarged at tip."

"Length of fore wing 4·5 mm."

"From Pemberton, West Australia, 19 Nov. (Darlington)."

Type in the Museum of Comparative Zoology, Harvard College, U.S.A.

Smicridea ulmeri Banks (figs. 229*a*, *b*).

Smicridea sp. Ulmer, 1916, *Arkiv. f. Zool.*, **10** : 15.
Smicridea ulmeri Banks, 1939, *Bull. Mus. Comp. Zool. Harv.*, **85** : 492–493, fig. 5.

Banks describes the species as follows :

" Head dark, with snow-white hair, and also on the thoracic notum, palpi, legs and abdomen yellowish, antennae pale, slightly annulate with dark ; wings

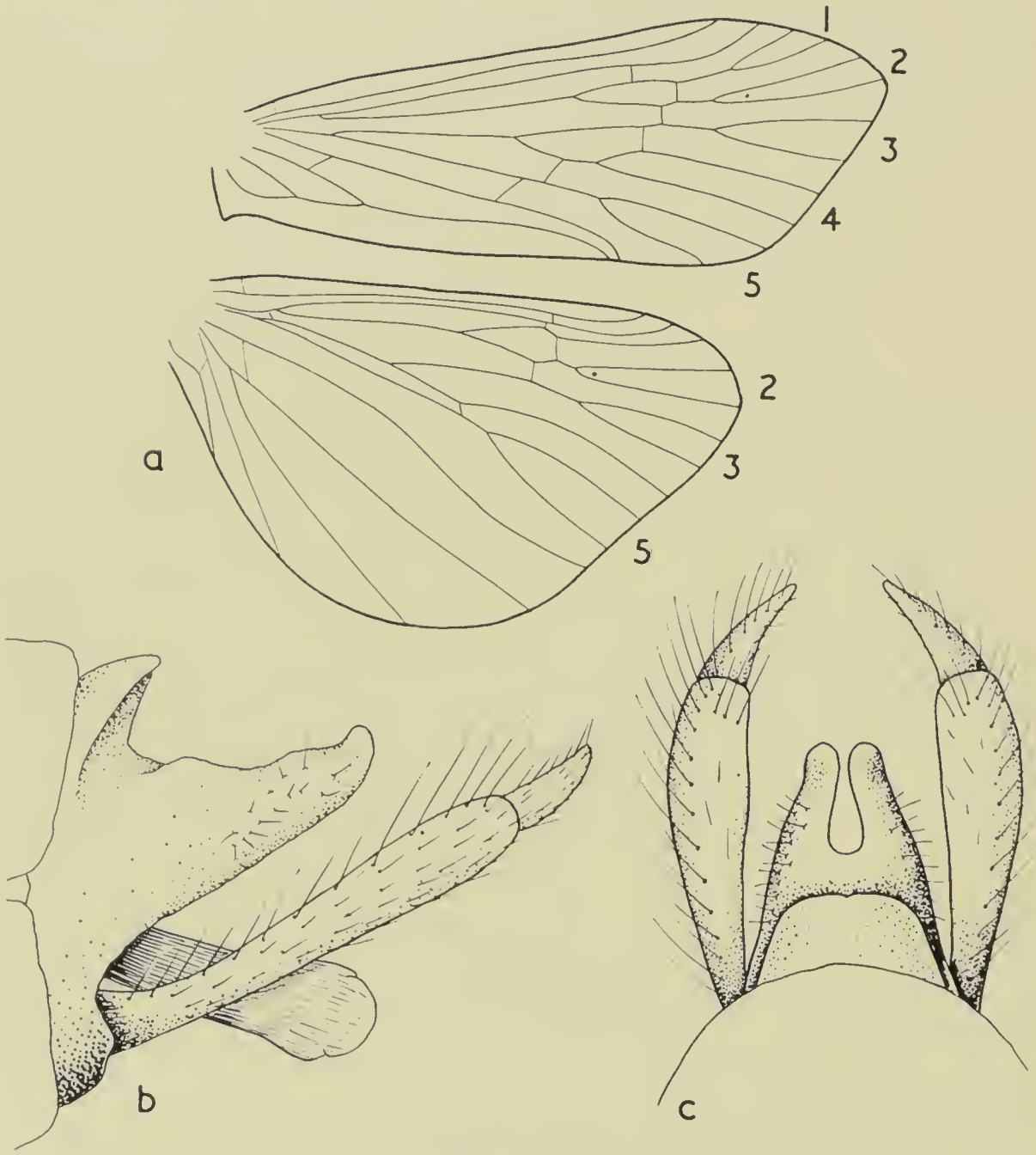

FIG. 230.—*Asmicridea edwardsi* (McLachlan). ♂. *a*, wings ; *b*, genitalia, lateral ; *c*, dorsal.

white, scarcely darkened in the stigmal area of the fore wing ; venation much as in the other species, fork one not as far back as two and three, hardly as long as its pedicel, forks four and five very long."

"Male genitalia show a short and broad superior plate, with a broad emargination at tip, the claspers have the apical part short, and somewhat tapering to the tip, the penis is only a little swollen at tip."

"Fore wing 5 mm. long."

"From Ravenshoe, Atherton tableland, 3000 ft., 27 April, Queensland, Australia, (Darlington)."

Type in the Museum of Comparative Zoology, Harvard College, U.S.A.

Banks considers that this is the species to which Ulmer referred in the record given above.

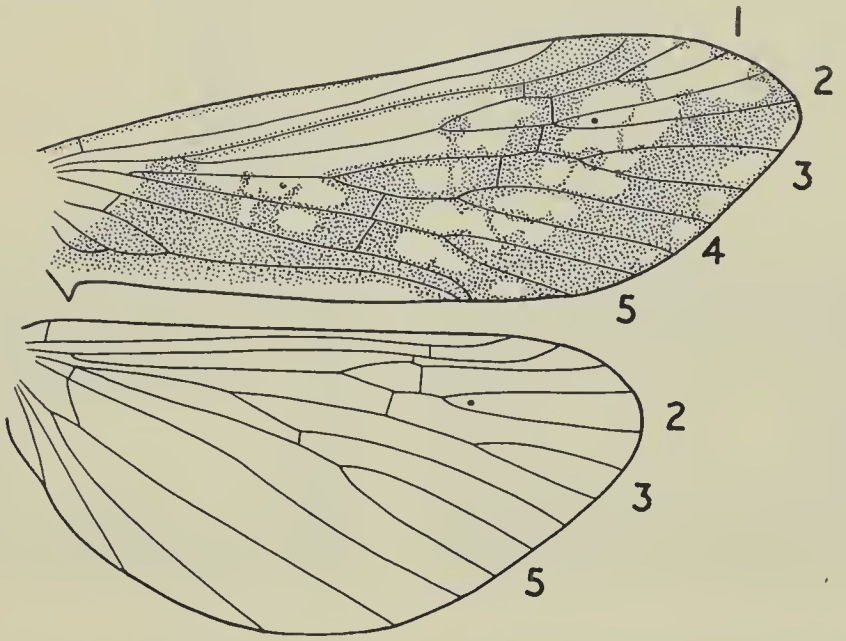

Fig. 231.—*Asmicridea grisea* (Mosely). ♂ wings.

Asmicridea gen. n.

Spurs 2, 4, 4. In the male there are no rounded, chitinous, reticulated bodies contained within the abdomen as in *Smicridea* McLachlan.

In all other respects *Asmicridea* agrees with McLachlan's genus *Smicridea*.

Type species.—*Smicridea grisea* Mosely, 1933.

Key to Species of *Asmieridea*.

1. Male, posterior wing twice as long as broad . . . . *A. grisea* (Mosely) (p. 336).
–. Male, posterior wing one-and-a-half times as long as broad
A. edwardsi (McLachlan) (p. 333).

Asmicridea edwardsi (McLachlan) (figs. 230, 232 *b–e*).

Hydropsyche edwardsi McLachlan, 1866, *Trans. ent. Soc. Lond.*, (3) **5** : 269, pl. 17, fig. 7.
Smicridea nivea Ulmer, 1905, *Stett. ent. Zeit.*, **66** : 104, pl. 4, figs. 136–7.
Hydropsyche edwardsi Ulmer, 1907, *Gen. Inseet.*, **60a** : 171.
Smicridea edwardsi Ulmer, 1916, *Ark. f. Zool.*, **10** : 13, figs. 18–20.
Smieridea edwardsi Mosely, 1933, *Ann. Mag. n. H.*, (10) **12** : 218, pl. 8, figs. 4, 5, text-figs. 4, 5.

The species, described originally in *Hydropsyche*, was transferred to *Smicridea* by Ulmer in 1916. The *type* is from Melbourne. The example described and figured by Ulmer is from Cedar Creek, Queensland. The

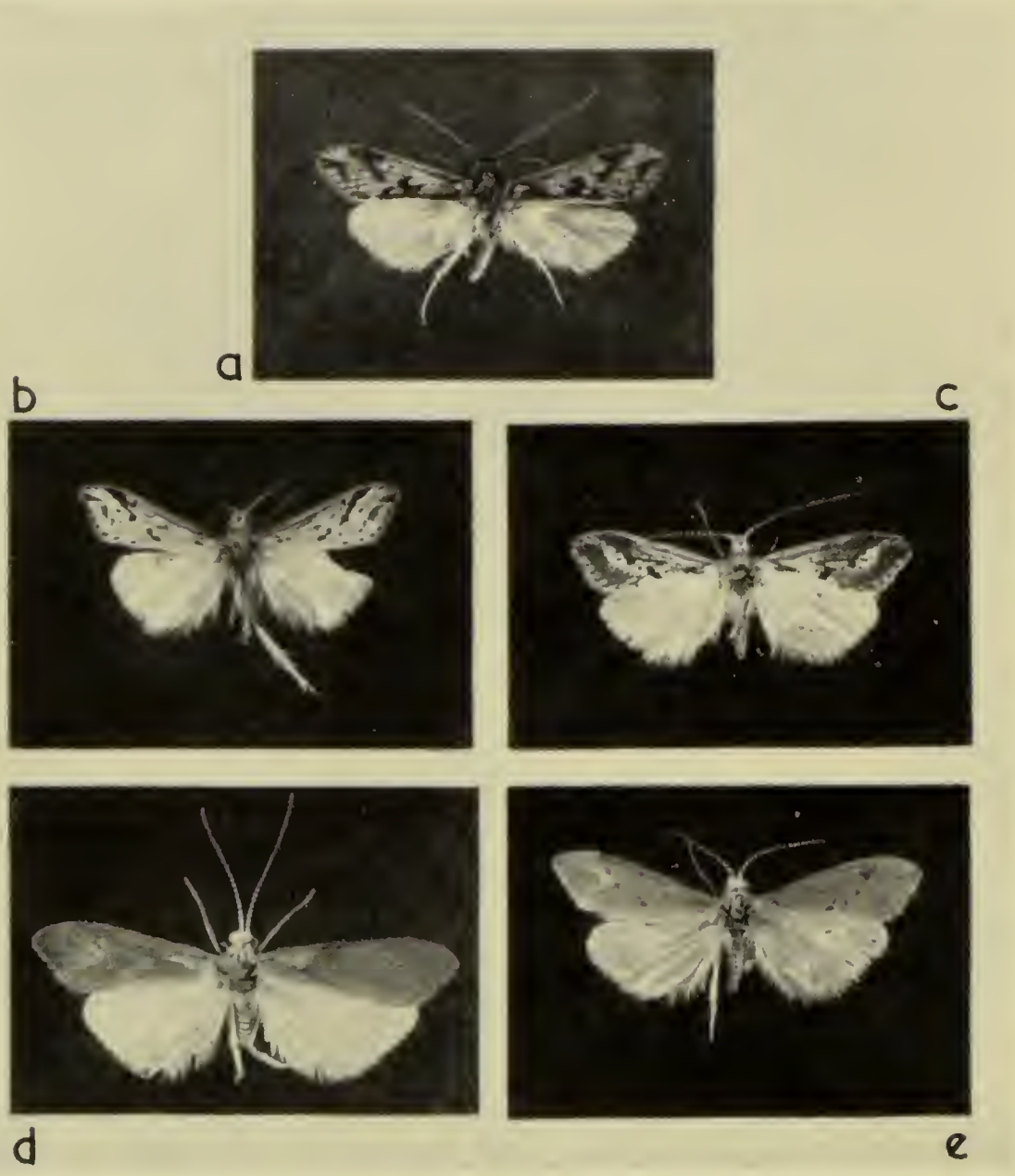

FIG. 232.—*Asmicridea* spp. ♂♂. *a*, *A. grisea*, Great Lake, Tas.; *b–e*, *A. edwardsi*; *b*, Deloraine, Tas.; *c*, Wilmot, Tas.; *d*, Upper Murrumbidgee R., N.S.W.; *e*, Mt. Kosciusko, N.S.W. (Photo. D. E. K.)

example described and photographed by myself in 1933 was taken at Perth, Tasmania. In 1938 the British Museum (N.H.) purchased the McLachlan Collection, which includes the type of the species, and there is also a very long series of this species in the Tillyard Collection.

In this material there are forms which differ widely from each other and from the type both in size and colour pattern, ranging from a nearly pure white to dark grey, and with an expanse from 13 mm. to 22 mm. I have been unable to find any structural characters differing sufficiently to warrant these forms being separated into distinct species, and I have been forced to the conclusion that these forms are merely variations of *edwardsi*, although the colour patterns are, to a large extent, localized in widely separated regions and appear to be restricted to their own particular localities.

None of these forms appears to possess the internal abdominal structures which characterize *Smicridea*, and I am therefore placing them all in a new genus, *Asmicridea*. The *type*, from Melbourne, is very pale, with merely a pale ochraceous streak slanting basally from the pterostigma and a darkening of the costa throughout its length on the anterior wing ; posterior wing, indicated by McLachlan as being pearly white, is now stained slightly brownish, possibly by mould.

From Mt. Kosciusko, N.S.W., there is a long series of specimens, almost entirely white, with just three or four dark specks on the anterior wing.

From Hampton, New South Wales, there is a series with the wings slightly infuscated, and a similar form occurs at Ebor, N.S.W.

From the Upper Murrumbidgee River there is a pair of males differing very considerably in general appearance as well as in size from the rest. They expand to 22 mm. as against an average expansion of 16 mm. and, although the posterior wings are snowy white as usual, the anterior are almost unicolorous fawn, one example being slightly paler than the other. The genitalia of this paler example are here figured, and if a comparison be made between this figure and that given in 1933 of the Tasmanian example, from Perth, it will be seen that there is no appreciable difference such as would warrant their being separated specifically, though the terminal joint of the inferior appendage is perhaps a little longer in the Australian insect.

Apart from the examples from Perth, all the Tasmanian specimens are darker in the anterior wing than those from the mainland. The darkest of all are from Wilmot, and in these the colour approximates to that of *grisea*. The shape of the posterior wing, however, serves to distinguish the two species.

The smallest of the series are from the Cradle Mountain, and in these the colour and marking of the wings are much paler and less distinct than in the other Tasmanian forms.

The Perth examples have snow-white anterior wings with a few jet-black spots. Females of the species in all groups are scarce in the collection.

McLachlan describes the species as follows :

"Antennae whitish-ochreous, fuscous towards the apex, and with the tips of the joints annulated with fuscous. Head and thorax fuscous, clothed with white pubescence. Palpi greyish-fuscous. Anterior wings white, the costal margin greyish, and with a dark-grey oblique transverse streak extending from near the apex of the costal margin half-across the wing : apical cilia greyish. Posterior wings pure pearly-white, without any trace of darker markings, and furnished with long white cilia. Legs greyish-ochreous, the posterior tibiae and tarsi white, with long white

hairs. Abdomen greyish-white, darker beneath. In the male, the inferior appendices are long and forcipate, the first joint very short, the second extremely long, pale greenish-white; penis testaceous at the apex, without any apparent subapical projection."

"Long. corp. 3 lin.; Expanse alar. 8 lin."

"Habitat ad Melbourne in Australia (Edwards)."

The adults occur from October to March.

The abdomen of McLachlan's *type* is now missing, so the further description of the *genitalia* which appears below, together with the figures, have been made from one of the Murrumbidgee examples.

Genitalia, ♂.—Dark ochraceous in colour. Margin of the terminal dorsal segment produced at its centre in a strongly chitinized, rounded plate, from the side triangular, with an acute apex. Welded to this plate is a pair of superior appendages united from their bases to about half their length, lying close to each other with the apices slightly upturned. From the side the segment and appendages form a broad triangle with the upper margin deeply excised. Penis with very slight angular dilatations on each side towards the base and small rounded processes at each angle of the apex. Inferior appendages two-jointed; basal joint long, terminal joint rather short.

Asmicridea grisea (Mosely) (figs. 231, 232*a*).

Smicridea grisea Mosely, 1933, *Ann. Mag. n. Hist.*, (10) 12 : 217.

Head black, clothed with black hairs. *Antennae* dark ochraceous with light fuscous annulations. *Palpi* light fuscous, first, second and third joints short, about equal in length; fourth twice as long as third; fifth about as long as second, third and fourth together. Anterior and median *legs* dark fuscous, sparingly clothed with light-coloured hairs. Posterior legs cream-coloured, with heavy, white, silky fringes. *Anterior wing* silvery grey, with numerous fuscous patches as indicated in the figure. Fork no. 2 sessile or with a footstalk. *Posterior wing* opaque snowy white; posterior margin not unduly dilated, fringes white. Abdomen dark reddish fuscous; lateral filaments strongly developed. Male genitalia as in *A. edwardsi* (McLachlan).

♀. Somewhat larger than the male, Median legs dilated. Anterior wing indistinctly marked with greyish; posterior wing greyish.

Length of anterior wing, ♂, 8 mm.; ♀, 11 mm.

TASMANIA: Great Lake, xii.1929, i.1931, i.1932, xi.1933, ii.1934, C. Parker; 28.i–5.ii.1933, R. J. Tillyard; xii.1936, J. W. Evans; North Esk, 21.i.1933, R. J. Tillyard.

This species is distinguished from *A. edwardsi* (McLachlan) chiefly by the less dilated posterior wing of the male, and by the wing pattern.

Diplectrona Westwood.

Diplectrona Westwood, 1839, *Intro. Mod. Class. Ins.*, 2, *Gen. Syn.* : 49.
Diplectrona Ulmer, 1907, *Gen. Insect.*, 60a : 176.

Spurs 2, 4, 4. ♀ *intermediate tibiae* and *tarsi* not dilated. *Antennae* slender, about the same length as the wings, joints elongate, each with a

false suture in its middle. Towards the base the joints are simple, but in the apical portion each joint is enlarged internally, giving this portion of the antennae a serrate appearance. *Maxillary palpi* with the basal joint short; second, third and fourth long but with the second the longest; third and fourth nearly equal; fifth scarcely as long as the others united.

Anterior wing short and broad. Apical forks nos. 1, 2, 3, 4 and 5 present; nos. 1 and 3 short with long footstalks. Discoidal cell short and broad; median cell somewhat longer. *Posterior wing* broader than the anterior; discoidal cell longer. Apical forks nos. 1, 2, 3 and 5 present; no. 1 short. Radius much curved at its end in both wings.

On each side of the abdomen, on the basal margin of the fifth ventral segment, at its point of junction with the membranous pleurite, is a long, slender filament. Within the walls of the abdomen of the ♂ are four large, membranous sacs with reticulated surfaces, supposed by some to be associated with the tracheal system.

Type species.—*Hydropsyche flavo-maculata* Stephens, 1836, *nec* Pictet, 1834 (by original designation) (=*Diplectrona felix* McLachlan 1878).

Key to Species of *Diplectrona*, Males.

1. Dorsal plate with apical angles produced in spines . . . see footnote*.
–. Dorsal plate not so produced . . . . . 2.
2. Penis simple, without large spines . . . . . 3.
–. Penis armed with one or more pairs of large spines . . . . . 4.
3. Inferior appendages slender, terminal joint short; no apparent upper penis-cover . . . . . *D. zealandensis* sp. n. (p. 340).
–. Inferior appendages stout; terminal joint about two-thirds as long as basal; upper penis-cover present, bifid, the dilated branches with acute apices *D. satana* sp. n. (p. 342).
4. Median cell in anterior wing small, shorter than discoidal cell *D. castanea* sp. n. (p. 342).
–. Median cell as long as or longer than discoidal cell . . . . . 5.
5. Inferior appendages with basal joint produced in an inner branch near apex. Median cell unusually long . . . . *D. bifurcata* sp. n. (p. 344).
–. Inferior appendages normal, median cell not unusually long . . . . . 6.
6. Penis with one pair of strong, upturned hooks, and possibly another pair of very small hooks between them; no strong upturned transverse ridge on upper surface of penis . . . . . *D. bourina* sp. n. (p. 345).
–. Penis with two pairs of strong upturned hooks; a strong transverse upturned ridge on upper surface of penis . . . . *D. cognata* sp. n. (p. 347).

Diplectrona angusta Banks.

Diplectrona angusta Banks, 1939, *Bull. Mus. Comp. Zool. Harv.*, 85 : 495, figs. 16, 49.

Banks describes the species as follows :

"Head brown, posterior warts pale; palpi brown, antennae pale, beyond base annulate with brown; prothoracic warts pale, rest of notum brown, except pale meso-scutellum, pleura and beneath more yellowish; abdomen brown; legs yellowish, spurs also."

* Dorsal plate with apical angles produced in strong convergent spines *D. rossi* sp. n. (p. 340 footnote)

Dorsal plate with apical angles each forming two slender processes *D. angusta* Banks (p. 337)

" Fore wings brown, sparsely clothed with short black hair, the three cross-veins, forking of medius, and end of anal veins faintly white ; hind wings gray with short black hair."

" Fore wings more slender than usual : discal cell about five times as long as broad, fork one with a short pedicel, fork two back on discal less than width of cell, fork three scarcely longer than one, with a pedicel two thirds its length, fork four a little longer than two, back on median cell more than width of cell, fork five

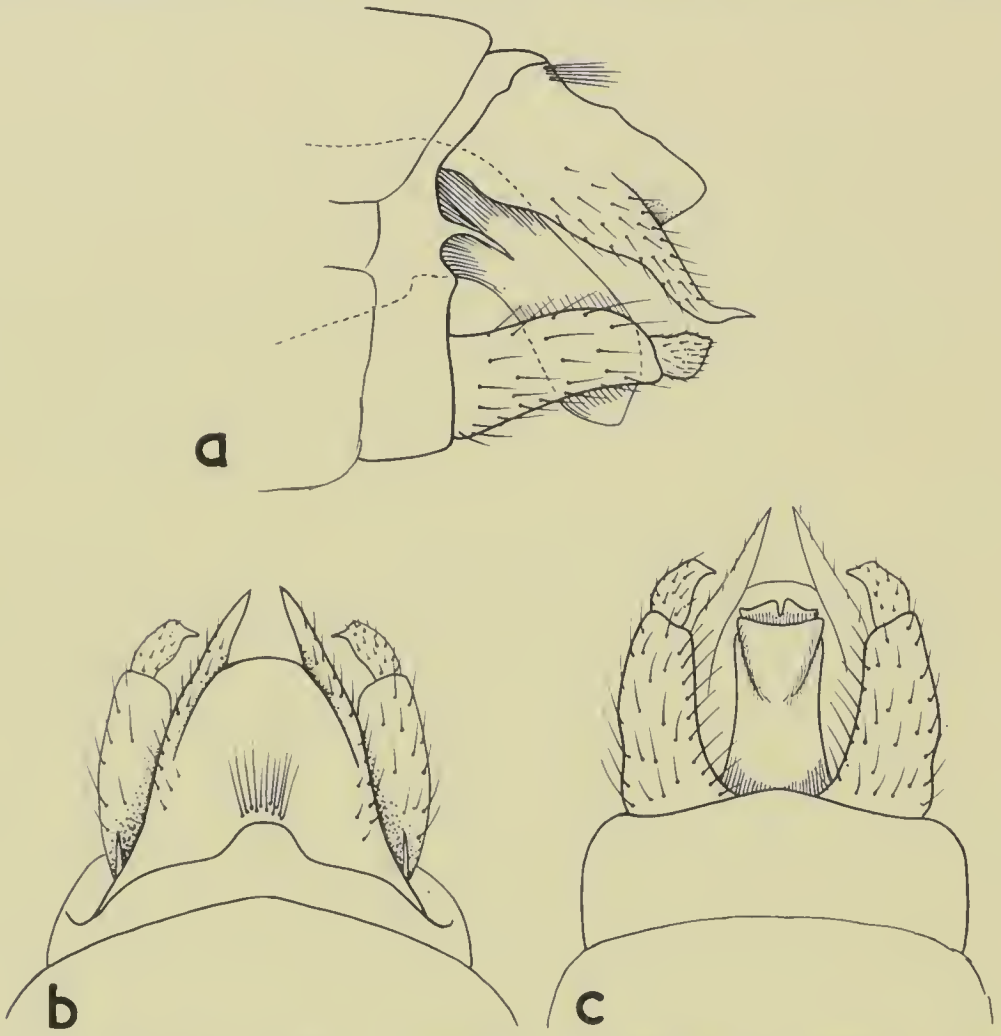

FIG. 233.—*Diplectrona rossi* sp. n. (Kimmins). ♂ genitalia. *a*, lateral ; *b*, dorsal ; *c*, ventral.

a little longer and plainly wider than four, cross-vein from radial sector to medius oblique, and that from cubitus to anal also oblique."

" In hind wings discal cell still more slender, fork one with very short pedicel, fork two back a little on discal, fork three no longer than one, and with a pedicel about its length, fork five long and wide."

" Male genitalia have a superior plate with a slender lateral process each side curving in towards its fellow, the claspers rather short and heavy, the apical part short and pointed, the penis is enlarged at tip."

" Fore wing 10 mm. long ; 4 mm. wide."

" From The Dorrigo, New South Wales, Australia, 3000 ft., 27 Febr. (Darlington)."

Type in the Museum of Comparative Zoology, Harvard College, U.S.A.

[A male from Queensland, National Park, 1500–2000 ft., 28.ii.1921, R. J. Tillyard, although rather smaller, I believe to belong to this species. The differences in genitalia are not greater than might be expected in comparing a cleared example with a figure drawn from a dried one, and also allowing for the difference in locality. The following description and my figures have been made from this example.

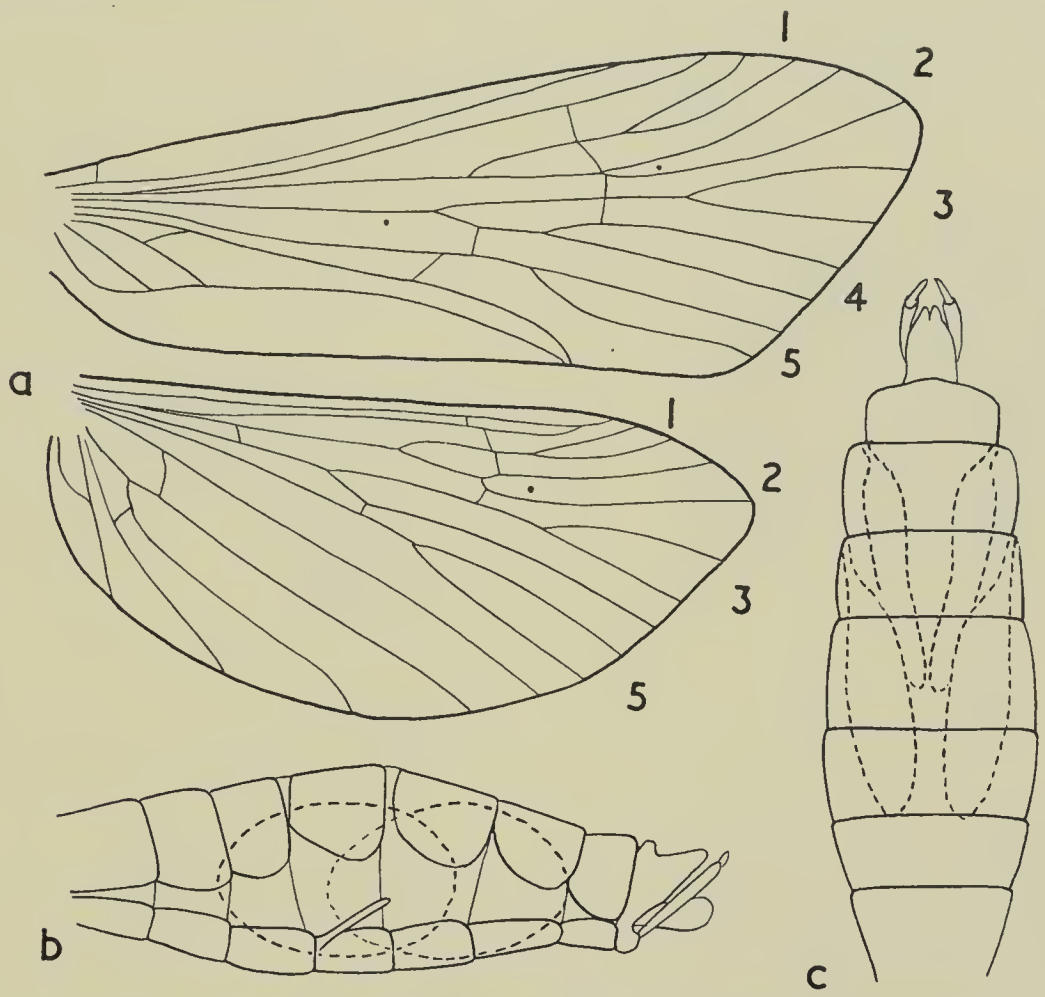

Fig. 234.—*Diplectrona zealandensis* sp. n. ♂. *a*, wings ; *b*, abdomen, lateral ; *c*, dorsal.

Abdominal sacs of moderate size, each extending basally a little into the preceding segment.

Genitalia.—Ninth dorsal segment reduced in width, slightly produced at its centre in a rounded lobe. Welded to it is a large dorsal plate, hood-like, a tuft of bristles at its base and a membranous area at the centre of its apical margin, simulating an excision, each lower apical angle further produced in a long, strong spine, sloping inward. Lateral margins of the ninth segment produced in a small, slender spine, slightly curved downward. Penis stout, from the side a little constricted before the apex. Lower apical margin

scooplike ; upper forming two blunt processes, separated by a narrow excision. Inferior appendages short and stout. Terminal joint small, triangular from the side, quadrangular from above, inner apical angle forming a small beak.

Length of anterior wing, 7 mm.—D. E. K.]*

Diplectrona zealandensis sp. n. (figs. 234, 235).

Head nearly black, with two large, conspicuous warts nearly meeting at the centre of the hind margin. *Palpi* and *legs* pale castaneous. *Antennae* rather thick, dark, serrate along the inner margin. *Anterior wing* dark castaneous with a few conspicuous but indefinite golden blotches which catch the light,

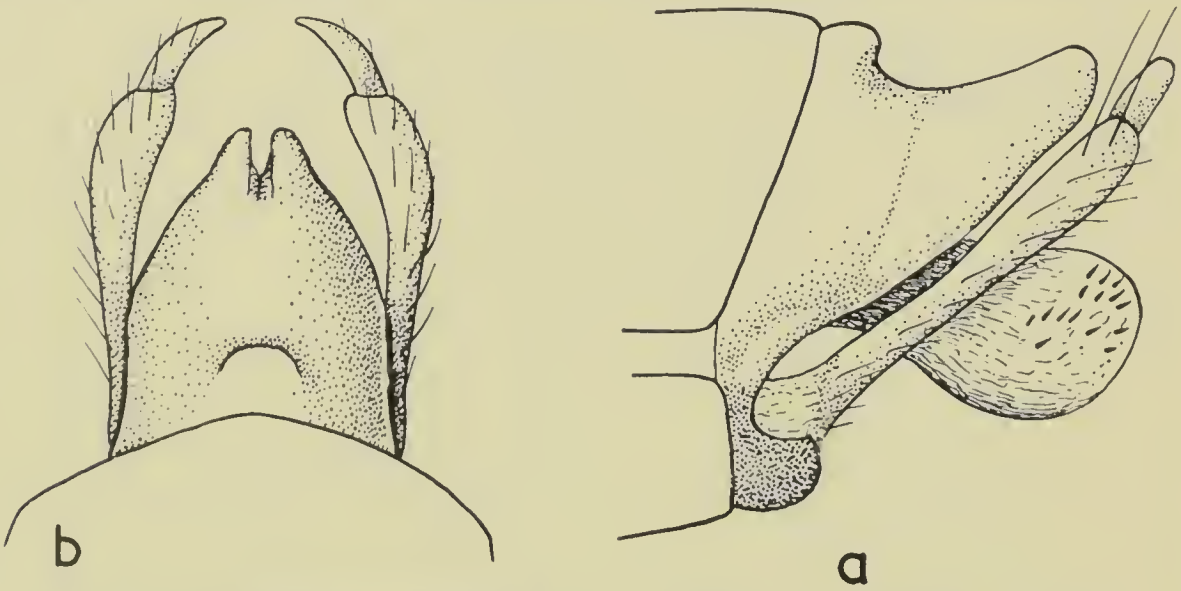

Fig. 235.—*Diplectrona zealandensis* sp. n. ♂ genitalia. *a*, lateral ; *b*, dorsal.

giving the wing a soft, velvety appearance ; only one cross-vein between the costa and sub-costa.

Genitalia, ♂.—Ninth tergite produced in a large plate, triangular from the side, with a wide excision along the upper margin, making a hook-like process towards the base : apex produced and rounded. From above, excised to make a pair of rounded processes. Penis much dilated at the apex in the cleared examples, membranous, and set with short, strong teeth. Inferior appendages two-jointed. Basal joint dilated at the apex ; second joint short with a very acute apex as seen from above. Lateral abdominal filaments short and blunt. Internal tracheal bodies four in number, long and narrow from above.

Length of the anterior wing, ♂, 8 mm.

New Zealand : Wilton's Bush, various dates from September to February. 9 ♂, 5 ♀ ; Arthur's Pass, 3000 ft., 19.i.1923, 1 ♀ ; Wellington, 1 ♂ ; S. Karori.

* Since this work was set in galley, Dr. H. H. Ross has shown me drawings of *D. angusta*, holotype. The genitalia are clearly distinct from those of the Queensland example (fig. 233). The dorsal plate of *angusta* is excised almost to its base, the side margins each composed of two slender processes. The Queensland example, described above in square brackets, therefore becomes the *type* of **Diplectrona rossi** sp. n. (Kimmins).

23.ix.1936, 2 ♂; Wainuiomata River, 1 ♂, Rona Bay, 30.ix.36, 1 ♂, G. V. Hudson.

Type, ♂, from Wilton's Bush, 10.ii.1925 (abdomen mounted in balsam).

The genitalia of this species conform with *Smicridea* rather than with *Diplectrona*, and in the posterior wing, the sub-costa runs into the radius, which is unusual in the genus.

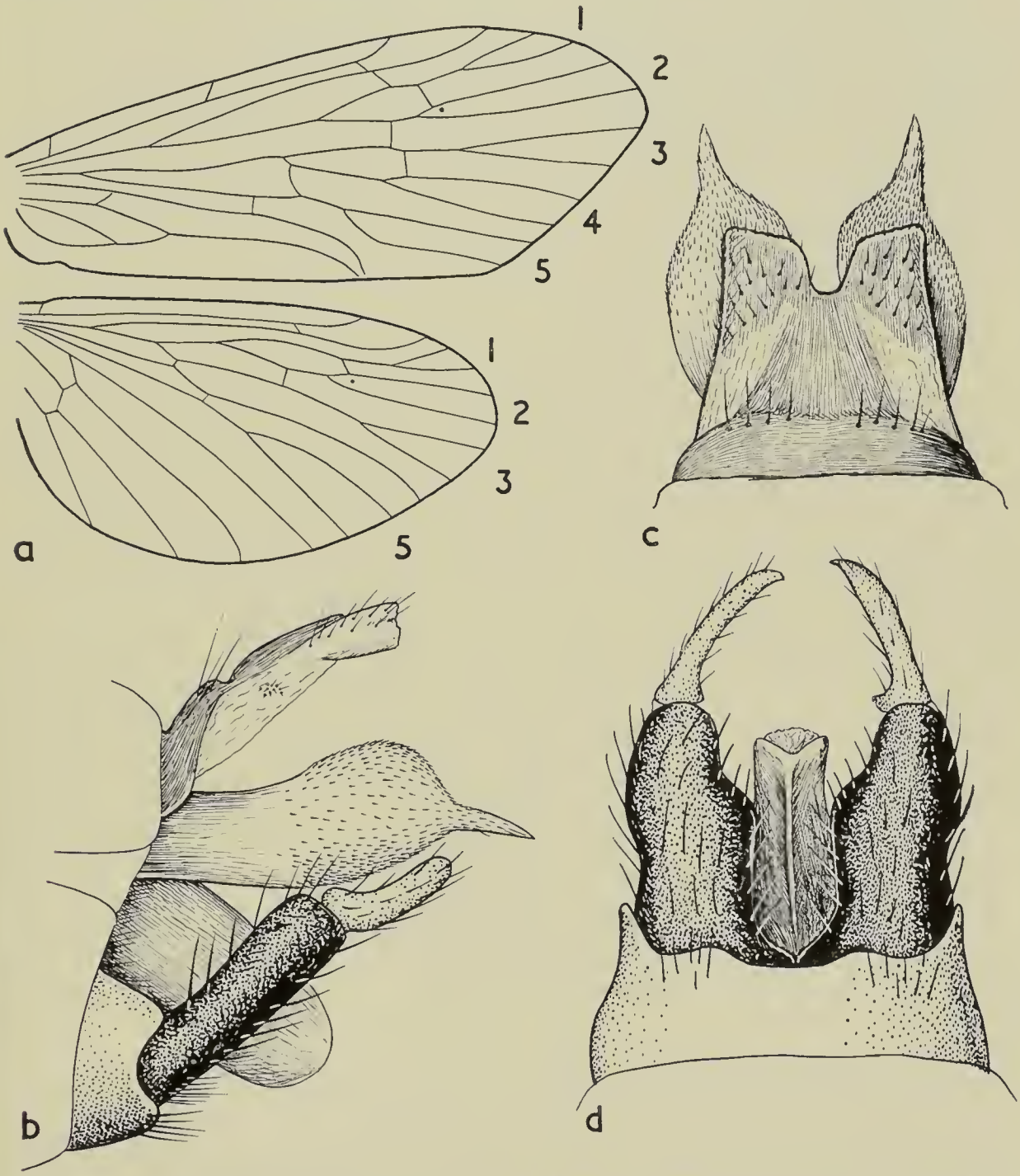

Fig. 236.—*Diplectrona satana* sp. n. ♂. *a*, wings; *b*, genitalia, lateral; *c*, dorsal; *d*, ventral (upper penis-cover omitted).

Diplectrona satana sp. n. (fig. 236).

Insect generally black. *Neuration* differing somewhat from that of *D. zelandensis*, as may be seen on a comparision of the figures.

Genitalia, ♂.—The abdomen contains four very large, reticulated bodies, of which the distal pair is round and the basal pair long and oval. Apical margin of the ninth dorsal segment slightly excised. Beyond it is a large, quadrate dorsal plate, apical margin deeply excised, the excision very nearly quadrate. Upper penis-cover forming a pair of processes, covered with minute hairs, and becoming globular towards their apices which are produced in pointed spurs. Penis short and fleshy, directed downward, lower surface forming a narrow keel. Inferior appendages two-jointed. Basal joint broad from beneath; inner margin sinuous. Terminal joint slender, with a slight projecting angle on the inner margin at the base. Apical margin of the ninth segment sinuous.

Length of the anterior wing, ♂, 7 mm.

AUSTRALIA: Queensland, 1 ♂, F. P. Dodd.

Diplectrona castanea sp. n. (Kimmins) (fig. 237).

♂. *Head* dark fuscous, with castaneous and golden hairs. *Antennae* and *palpi* piceous. *Thorax* dark fuscous, with golden brown hairs. *Legs* fulvous, becoming fuscous apically. *Abdomen* fuscous. Internal reticulated sacs rather small, each pair confined within the limits of its own segment. *Wings* dark reddish fuscous, with short castaneous pubescence and longer golden hairs on the veins of the anterior wing. Membrane of the anterior with whitish spots at the fork of media and at arculus. *Neuration* as figured. Median cell rather short.

Genitalia.—Ninth dorsal segment strongly produced and hood-like. Below it can be seen the short dorsal plate, formed of two narrow, rounded, fringed lobes, separated by a wide excision. Penis stout at its base, consisting of a main stem, whose apex is apparently trifid, and two pairs of spines; one pair short, sinuously upcurved and hook-like, situated about mid-way, the other pair lying above the penis and extending almost to its apex, slender and acute. Beneath the penis is a pair of triangular plates, set on edge, and with hooked apices, possibly serving as a lower penis-cover. Inferior appendages rather short. Basal joint stout, rather wider at apex than at base. Terminal joint broad at base from side, tapering towards apex, which is abruptly bent inwards and acute; from below it is thin, outer surface somewhat concave, inner membranous. In the dried example this terminal joint was folded on to the apex of the basal joint, giving it the appearance of a truncate, single-jointed appendage.

Length of anterior wing, 10 mm.

TASMANIA: National Park, 3500 ft., 26.xii.1936, 1 ♂, J. W. Evans.

Type, ♂, with abdomen mounted in canada balsam. This species may be separated from the other described species of *Diplectrona* from Australia by the form of the penis and the inferior appendages. Three other examples, a

female, New South Wales: Ebor, 8.i.1916, R. J. Tillyard, an example without abdomen, New South Wales: Bathurst, 1300 ft., 10.xi.1884, McLachlan Collection, and a female from Queensland: Killarney, 9.xi.1914, R. J.

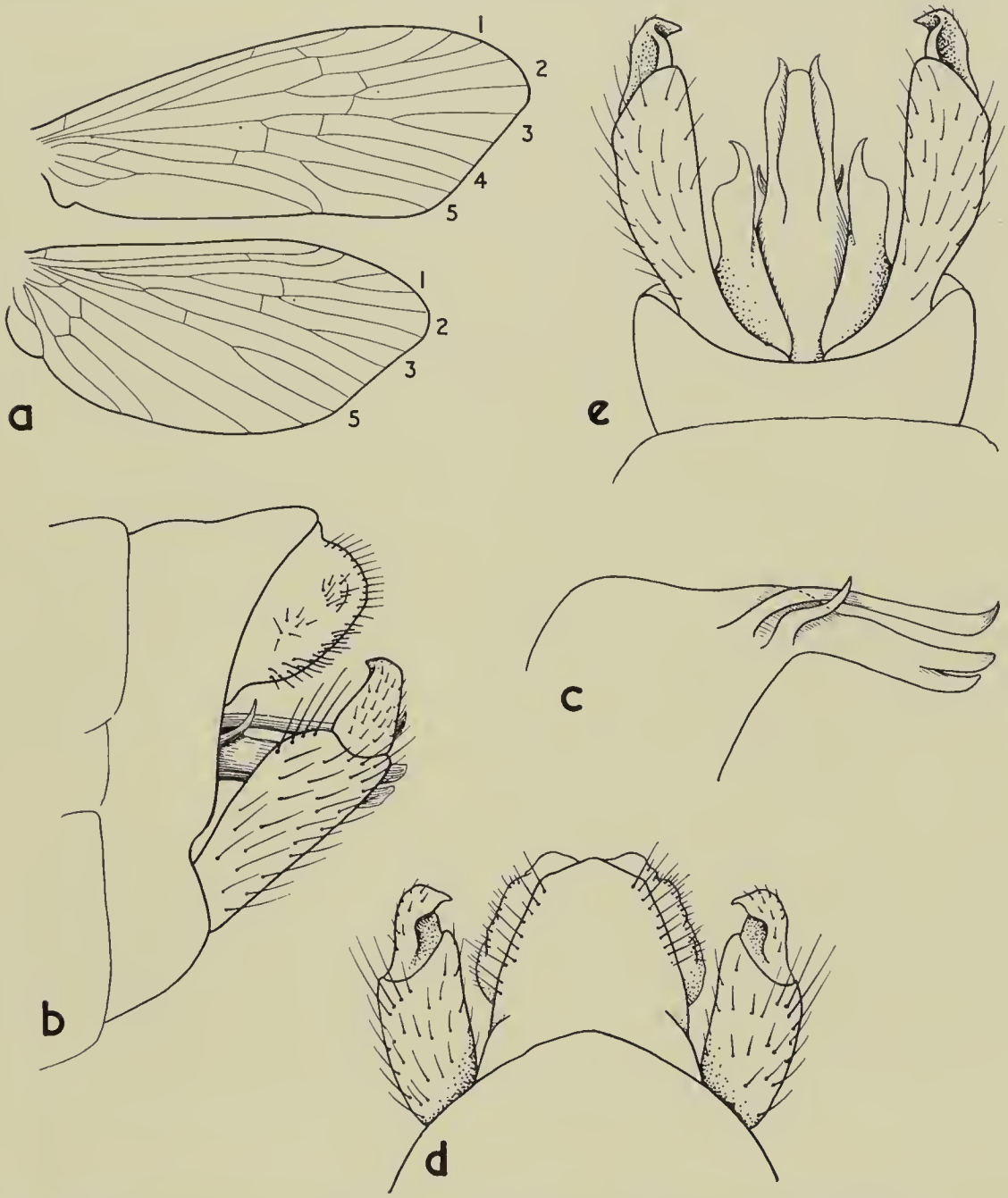

Fig. 237.—*Diplectrona castanea* sp. n. ♂. *a*, wings; *b*, genitalia, lateral; *c*, penis, lateral; *d*, genitalia, dorsal; *e*, ventral (dorsal plate omitted).

Tillyard, may belong to this species, judging by general appearance. In the absence of more definite evidence, however, they are not to be regarded as part of the type material.

Diplectrona bifurcata sp. n. (Kimmins) (fig. 238).

♂. Type and paratype in rather poor condition : wings much denuded, antennae wanting. General colour fuscous ; wings with traces of golden

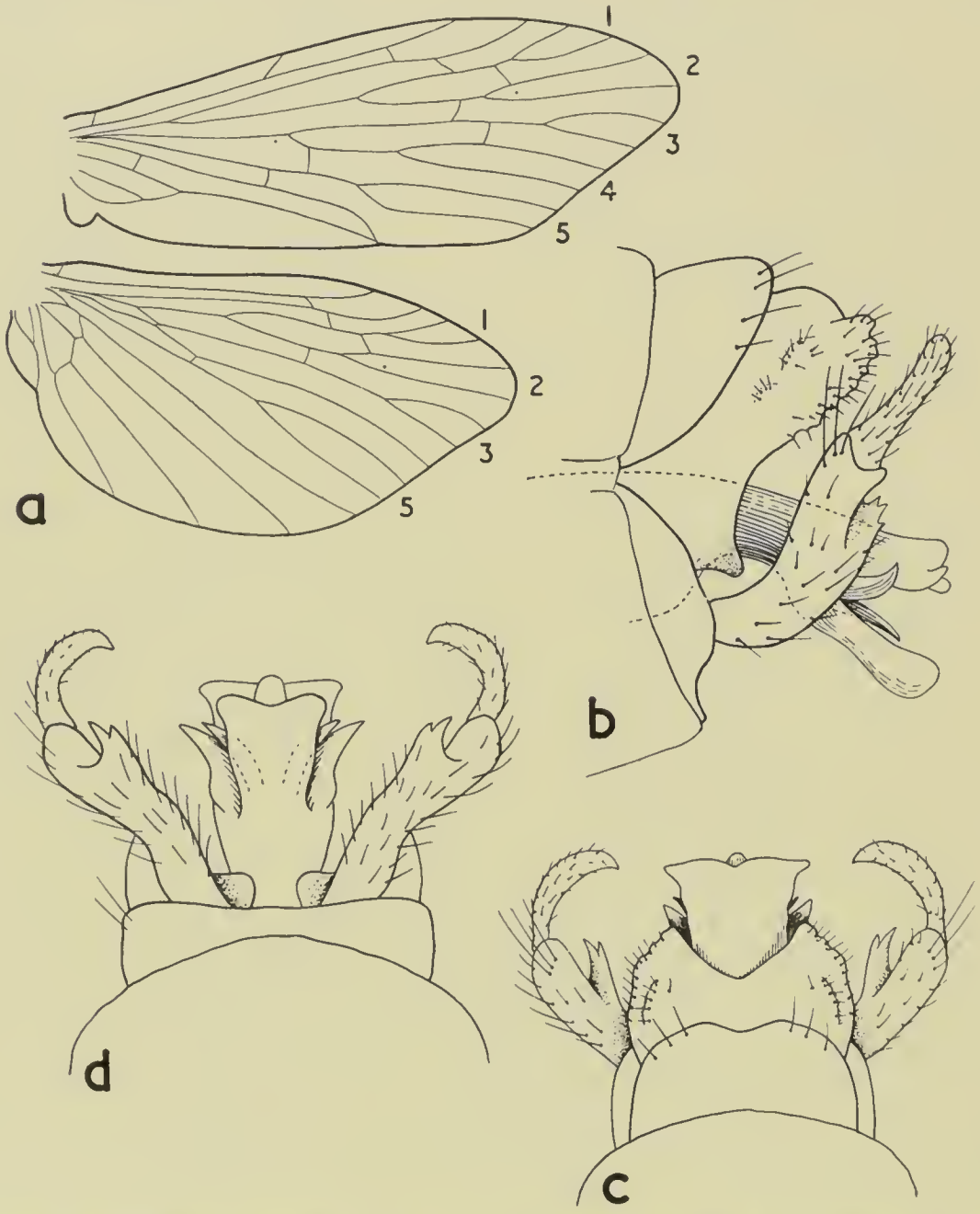

Fig. 238.—*Diplectrona bifurcata* sp. n. ♂. *a*, wings ; *b*, genitalia, lateral ; *c*, dorsal *d*, ventral (upper part of dorsal plate omitted).

pubescence. *Anterior wing* membrane with white spots at fork of media, cross-veins above, closing and below discoidal cell, cross-vein closing median cell, and at arculus. *Neuration* as figured. Median cell long, overlapping the

basal third of apical fork no. 4 in anterior wing. Abdominal sacs very large, extending basally to the fourth segment.

Genitalia.—Ninth dorsal segment moderately produced; centre of the apical margin slightly excised. Lateral margins with a deep incision: ventral segment rather narrow. The dorsal plate is rather unusually deep, extending downwards to below the middle of the ninth segment, its lower angles produced inwards in small rounded lobes below the penis. From above the dorsal plate appears as two irregular fringed lobes, separated by a V-shaped incision. Penis stout, with a central duct. Apex from the side divided into an upper and a lower portion, the lower the longer. Upper portion from above with a sinuous margin, outer angles slightly produced. Lower portion somewhat scoop-shaped; apical margin broadly excavate, angles rounded. Between the upper and lower portions of the apex are two pairs of short, curved spines, slightly divergent. Inferior appendages with the basal joint upcurved, rather stout, and with the lower margin beyond the middle produced in a flattened branch with a broad serrate apical margin. Terminal joint slender, nearly as long as basal joint, its apex turned inwards and acute.

Length of anterior wing, 11 mm.

AUSTRALIA: New South Wales, Mt. Kosciusko, 5000 ft., 24.i.1914, 1 ♂ (*type*), R. J. Tillyard; 10.xii.1931, 1 ♂, L. F. Graham (C.S.I.R. Collection).

Type, ♂ in the British Museum (N.H.), paratype ♂ in the C.S.I.R. Collection, Canberra.

The form of the inferior appendages is somewhat unusual, and the long median cell also gives a good character for the separation of this species from other species of *Diplectrona* from Australia. The terminal joints of the inferior appendages of the type have been slightly damaged by insects, but enough remains to make out their form.

Diplectrona bourina sp. n. (fig. 239).

Insect entirely black; *legs* with a velvety appearance.

Genitalia, ♂.—Apical margin of the ninth dorsal segment produced. There is a large dorsal plate, deeply and narrowly excised at its centre, with the inner margins of the excision elevated in rather broad ridges. From the side, the upper margin of this plate is convex, and the lower margin is produced in a triangular plate which lies close to the base of the penis. The penis is furnished with a pair of strong, upturned hooks as in *D. bidens* Ulmer. Inferior appendages with the terminal joints short and slender. The internal, abdominal, reticulated bodies are four in number, rather small and rounded.

Length of the anterior wing, ♂, 7 mm.

AUSTRALIA: S. E. Queensland, Tambourine Mts., 11–18.iv.1935, 1 ♂, R. E. Turner.

This and the succeeding species are distinguished from other Australian species of *Diplectrona* by the strong, upturned spines towards the apex of the penis.*

* See footnote p. 351.

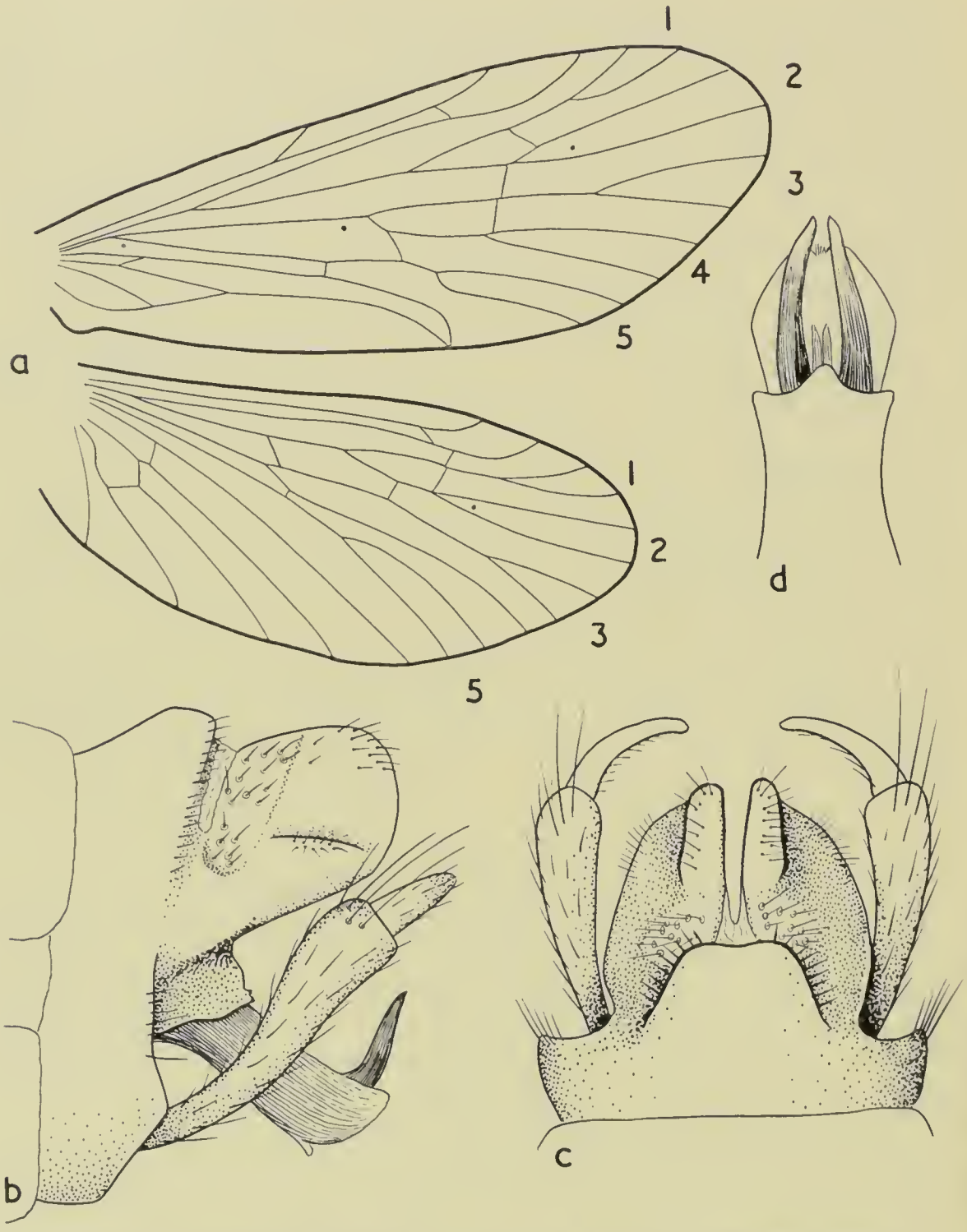

FIG. 239.—*Diplectrona bourina* sp. n. ♂. *a*, wings; *b*, genitalia, lateral; *c*, dorsal; *d*, apex of penis, dorsal.

Diplectrona cognata sp. n. (Kimmins) (fig. 240).

Closely allied to *D. bourina* Mosely, which it much resembles in general appearance. The *wings* are rather narrower and the colour more reddish. The chief differences are in the ♂ genitalia. The abdominal sacs are proportionately much larger than in *D. bourina*, those of the sixth segment extending almost to the base of the fifth segment.

Genitalia.—Ninth dorsal segment moderately produced, with the centre of the production slightly excised. Dorsal plate with the centre of its basal margin membranous, the lateral basal margins fused to the ninth segment. It is formed by a pair of rounded lobes, separated by an excision, and fringed with hairs. Seen from the side, there is a small spur-like projection on the lower margin towards the base, its apex curving upward and separated from the dorsal plate by a rounded excision. Penis stout, its upper margin turned up about midway in a transverse ridge. Beyond this ridge arise two pairs of hooks, the basal pair long, upturned, and larger than the other pairs. Lower margin of the penis produced considerably beyond the upper, less chitinized, consisting of two broad, thin, rounded plates, with between them a membranous finger-like process armed with a patch of short spines. Inferior appendages rather long and slender. Basal joint somewhat clavate ; terminal joint about one-third as long as basal, incurved and tapering.

Length of fore wing, 7 mm.

Australia : New South Wales, Wentworth Falls, 24.xi.1916, 1 ♂ (*type*), R. J. Tillyard ; Sydney, 2 ♂, McLachlan Collection.

This species is obviously closely related to *D. bourina*, but the difference in the size of the abdominal sacs and in the structure of the penis seem to warrant its separation as a distinct species. It is possible that this species may be the same as that described by Banks as *Sciops inermis*, but the spines of the penis are neither mentioned nor figured by him.*

Diplectrona sp., ♀.

[Two large females from S.E. Queensland : Tambourine Mts., 2–9, 18–25.iv.1935, R. E. Turner, are worthy of mention. In general colour they are pale yellowish-brown, the wings obscurely clouded with brownish (anterior, 12 mm.). In the absence of a male it is not proposed to give them a name.—D. E. K.]

Sciops McLachlan.

McLachlan, 1866, *Trans. ent. Soc. Lond.*, (3) 5 : 270.
Ulmer, 1930, *Treubia*, 11 : 488.

McLachlan describes the genus as follows :

"Antennae longer than the wings, slender, obsoletely serrated within ; basal joint very short. Head nearly quadrate above, the disk smooth and polished. Ocelli none. Maxillary palpi long and hairy ; the basal joint short ; the second and fourth equal ; the third nearly twice the length of the second ; the fifth very slender, thong-shaped, as long as the others united. Labial palpi small ; the basal joint

* See footnote p. 351.

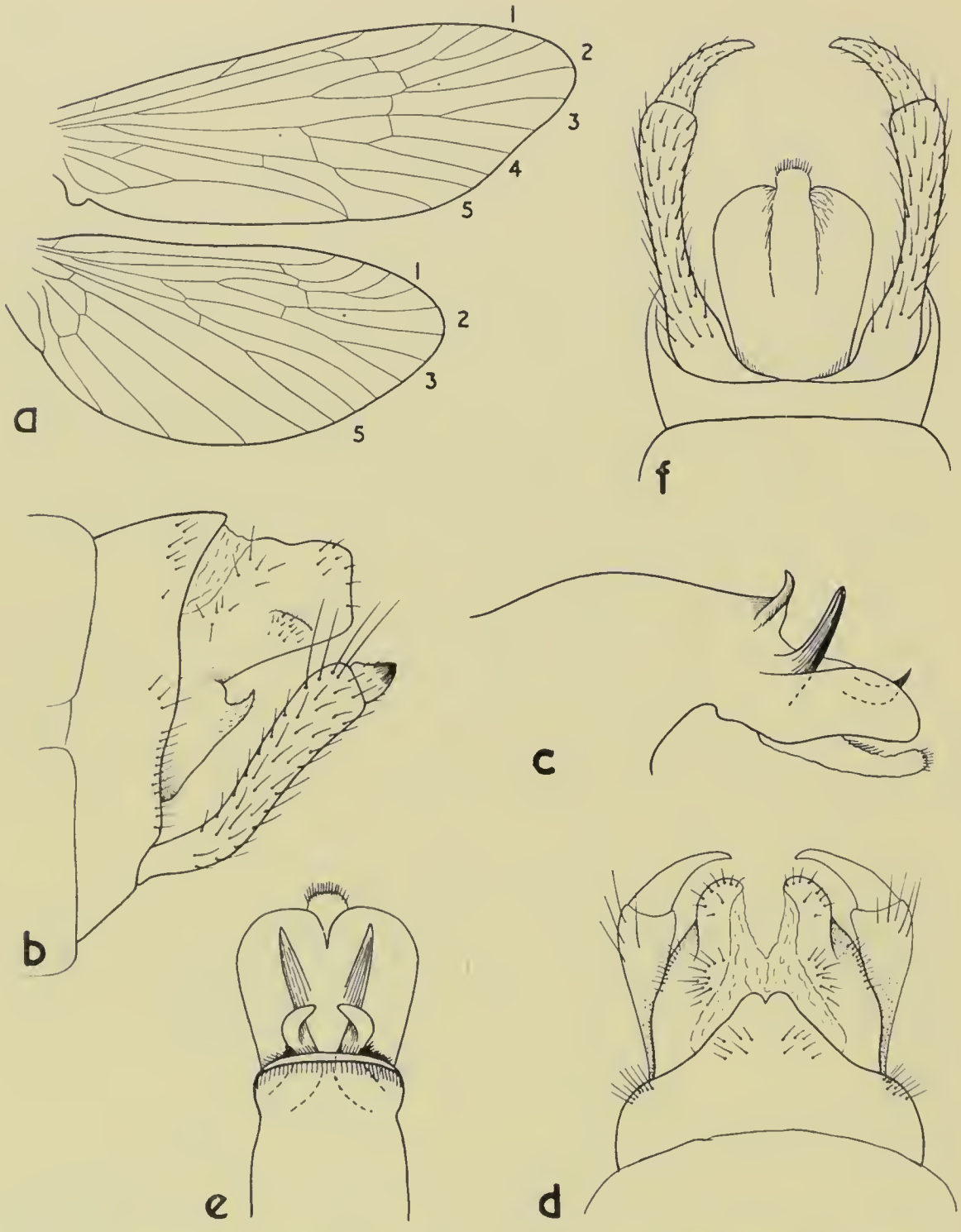

FIG. 240.—*Diplectrona cognata* sp. n. ♂. *a*, wings ; *b*, genitalia, lateral ; *c*, penis, lateral ; *d*, genitalia, dorsal ; *e*, apex of penis, dorsal ; *f*, inferior appendages and penis, ventral.

short ; the second longer ; the third very slender, much longer than the two others united. Prothorax rather distinct. Mesothorax subquadrate. Anterior wings narrow at the base, but broad at the apex ; the apical margin obliquely truncated, and very slightly excised just below the apex ; hairy clothing very slight, whence the wings appear smooth and polished ; neuration strong and distinct ; discoidal cell closed, rather large ; a transverse vein below this cell, another closing the cellula thyridii, and two others towards the base ; apical forks 1, 2, 3, 4 and 5 all present, forks 1 and 3 short. Posterior wings as broad as the anterior, and but slightly shorter ; fringes very short ; discoidal cell closed ; apical forks 1, 2, 3 and 5 present. Legs rather short ; the intermediate tibiae not dilated in the female. Spurs 2-4-4 ; anterior tibiae with two long and equal apical spurs ; intermediate and posterior tibiae each with two pairs of long and equal median and apical spurs. Abdomen robust ; the apex obliquely truncated in the female ; the male provided with pincer-like triarticulate [two-jointed—D. E. K.] inferior appendices."

Type species.—*Sciops unicolor* McLachlan, 1866.

This genus is closely related to *Hydromanicus* Brauer, from which it differs in the relatively longer third joint of the maxillary palpi.

Key to Species of *Sciops*.

1. Fore wing with discoidal cell four times as long as broad *S. inermis* Banks (p. 349).
–. Fore wing with discoidal cell two and a half times as long as broad *S. spinata* Banks (p. 351).

Sciops inermis Banks (fig. 241).

Sciops inermis Banks, 1939, *Bull. Mus. Comp. Zool. Harv.*, **85** : 494–495, figs. 9, 11.

Banks describes the species as follows :

" Body black, warts brown, head and thorax with some dark hair, antennae, palpi, and legs brown, spurs paler. Wings uniform blackish, with black hair ; hyaline white spots in fore wing over forking of medius, and over cross-vein from discal cell to medius, less distinctly over end of discal cell."

" Fore wings with discal cell over four times as long as broad, median cell about as long as discal, and scarcely wider, fork one with pedicel about one half length. fork two back to discal, fork three with pedicel fully one half its length, fork four about width of median cell back on cell, fork five about same length, but wider toward base ; in hind wing fork one only little longer than pedicel, fork two back to discal cell, fork three but little more than one half of fork two, fork five back to about middle of discal cell."

"Abdomen of male very broad and flattened ; genitalia (except penis) small and inconspicuous ; and the claspers close to abdomen. Above is a triangular piece. just below it each side a small, slender, pale piece, then a large piece whose tip (seen from the side) has a blunt process above, from below this extends the large, blunt penis, which (seen from above) is seen to have a median part and a rounded, almost hyaline extension along each side, the outer edge of which is thickened. The claspers are slender, tip fairly enlarged, apical part curved, slender, and pointed at tip."

" Fore wings 6·5 mm. long."

"From Wentworth Falls, 3 Jan., and Blackheath, 18 Jan., both in the Blue Mts., New South Wales, Australia (Darlington)."

Type in the Museum of Comparative Zoology, Harvard College, U.S.A.

FIG. 241.—*Sciops inermis* Banks. ♂. Genitalia, lateral, tip of penis, dorsal, and clasper, dorsal (after Banks).

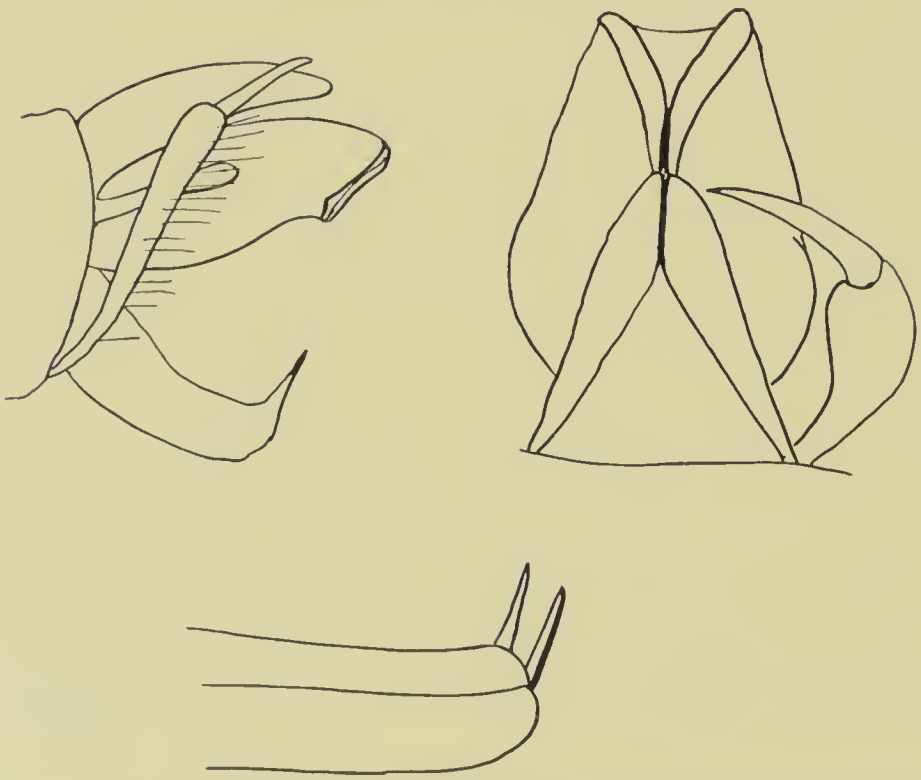

FIG. 242.—*Sciops spinata* Banks. ♂. Genitalia, lateral and dorsal, and penis from side (after Banks).

Sciops spinata Banks (fig. 242).

Sciops spinata Banks, 1939, *Bull. Mus. Comp. Zool. Harv.*, 85 : 493–494, fig. 31.

Banks describes the species as follows :

" Body deep black, lateral warts of head and prothoracic warts pale, genitalia paler, and penis pale yellow. Head and thorax with black hairs above, palpi and antennae black : legs dull yellowish brown, tarsi darker, hairs black ; both pairs of wings densely clothed with black hair."

" Head with a pair of large oblique posterior warts, and two very small ones each side in front ; third joint of palpus longer than second. Fore wings with discal cell two and a half times as long as broad ; fork one with pedicel longer than width of discal cell, fork two back almost to cell, fork three but little longer than its pedicel, fork four reaches only a little before cross-vein, fork five as long as four. In hind wing fork one a little longer than its pedicel, fork two with a short pedicel, fork three no longer than its pedicel, fork five with pedicel nearly one half its length. Abdomen extremely broad, and genitalia very small ; from above an elongate triangular piece with rolled and black edges, within paler ; below it a large median piece projects, its apex forked and with a broad ridge each side : the claspers small, basal joint moderately enlarged at tip, apical joint slender, pointed ; penis thick, bent down, at tip with a pair of upright spines."

" Fore wing 6 mm. long."

" From National Park, McPherson's Range, Queensland, Australia, 13 March, 3–4000 ft. (Darlington)."

Type in the Museum of Comparative Zoology, Harvard College, U.S.A.*

Austropsyche Banks.

Austropsyche Banks, 1939, *Bull. Mus. Comp. Zool. Harv.*, 85 : 496.

Banks describes the genus as follows :

" Related to Diplectrona and Sciops ; spurs 2-4-4 ; in fore wings fork four equal to five ; in hind wings the subcosta and radius run close together to near middle of discal cell, where they are connected by a very short cross-vein, and then separate, the radius bending behind but not as much as in Diplectrona so as scarcely to approach the discal cell and the space not narrowed ; discal cell very elongate ; costal area rather broader than in allied genera, not narrowed near middle, and with an oblique costal cross-vein before middle. Maxillary palpi with last joint very long, equal to rest of palpus, third joint rather longer than fourth, but scarcely, if any, longer than second. On the head the posterior warts are greatly enlarged so as to crowd the intermediate wart close to the anterior wart."

Type species.—*A. victoriana* Banks, 1939.

Austropsyche victoriana Banks (fig. 243).

Austropsyche victoriana Banks, 1939, *Bull. Mus. Comp. Zool. Harv.*, 85 : 496–497, figs. 6, 7, 10.

Banks describes the species as follows :

" Head dark, the warts pale, with rather scant mostly blackish hair ; palpi brown : antennae pale, joints beyond base annulate with dark ; pronotal lobes

* Drawings made by Dr. H. H. Ross of the genitalia of *S. spinata* holotype show that it has an affinity with *Diplectrona bourina* and *D. cognata*.—[D. E. K.]

pale, rest of thorax above dark, except a rather pale area through the middle; abdomen brown above, paler below; legs yellowish, tarsi rather more brown, spurs pale, hind tibia of male moderately long-haired behind."

"Fore wings gray, with darker stigmal area, and toward tip, clothed with sparse black hair, five hyaline white spots, one at end of anals, one over forking of medius, and one over each of the three principal cross-veins; hind wings pale gray, with gray and some black hairs, outer fringe dark."

"In fore wings discal cell is over five times as long as broad, fork one with a pedicel one-half its length, fork two reaching back on discal cell hardly width of cell, fork three about two-thirds of two, and with a pedicel one half its length, forks four and five subequal, but five reaching back a little further and wider towards base. In

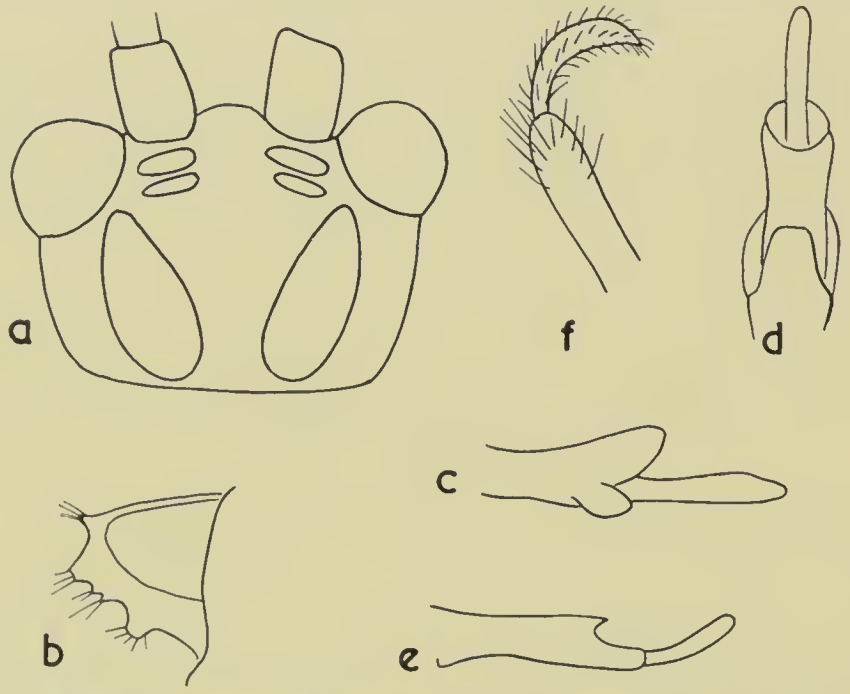

FIG. 243.—*Austropsyche victoriana* Banks. ♂. *a*, head, dorsal; *b*, "superior plate" from side; *c*, penis from side; *d*, from above; *e*, clasper from side; *f*, from above (after Banks).

hind wings the discal cell also very long, fully equal to second apical cell, fork one with short pedicel, fork two reaching back on discal cell about width of discal cell, fork three with pedicel one half its length, three cross-veins well separated as in the fore wings."

"Male genitalia have the claspers rather stout, with a tooth on the outer side toward tip of basal part, the apical part (from side) clavate, but the sharp tip is incurved, there is a dark basal superior plate, subtriangular, and beneath it a broad pale piece with some bristly lobes on the side; the penis has a slender apical part projecting from a broader tube, from the side this is bilobed."

"Fore wing, male 11·5 mm., female 14·5 mm."

"From Mt. Donna Buang, Victoria, Australia, 6 to 7 Dec., and from Du Creek, Warburton Range, Victoria, 6 Dec. (Darlington)."

Type in the Museum of Comparative Zoology, Harvard College, U.S.A.

13. Fam. **POLYCENTROPODIDAE** Ulmer.

Polycentropidae Ulmer, 1906, *Notes Leyd. Mus.*, **28** : 83, 109.
Polycentropidae Ulmer, 1907, *Gen. Insect.*, **60a** : 179.
Polycentropodidae Tillyard, 1926, *Ins. Austral. N.Z.* : 391.

Tillyard made the above change in family name in accordance with the rule laid down by the International Committee on Zoological Nomenclature that the name of a family be formed by adding -idae to the stem of the name of the typical genus, *Polycentropus*, from the Greek *polus* many, *kentron* spur and *pous*, genitive *podos* foot, stem *polycentropod-*, hence the family name *Polycentropodidae*.

Spurs 3, 4, 4. *Ocelli* absent. *Maxillary palpi* with the first and second joints short, intermediate joints varying according to genus, fifth joint long and articulated. *Antennae* stout, as long as or shorter than, the anterior wings. *Anterior wing* somewhat ovate, moderately broad ; pubescence dense ; discoidal and median cells always present. *Posterior wing* with the discoidal and median cells present or absent.

Key to Genera of *Polycentropodidae*.

1. In posterior wing forks nos. 1, 2, 3 and 5 present *Stenopsychodes* Ulmer (p. 363).
–. In posterior wing forks nos. 1, 2 and 5, or only 2 and 5 present . . . . 2.
2. In posterior wing forks nos. 1, 2 and 5 present . *Plectrocnemia* Stephens (p. 353).
–. In posterior wing only forks nos. 2 and 5 present. . . . . 3.
3. Anterior wing, fork no. 1 absent ; posterior wing with a closed discoidal cell *Nyctiophylax* Brauer (p. 357).
–. Anterior wing, fork no. 1 present ; posterior wing with discoidal cell absent *Polyplectropus* Ulmer (p. 359).

Plectrocnemia Stephens.

Plectrocnemia Stephens, 1836, *Ill. Brit. Ent. Mand.*, **6** : 168.
Plectrocnemia Ulmer, 1907, *Gen. Insect.*, **60a** : 182–183.

Spurs 3, 4, 4. *Intermediate tibiae* and *tarsi* of the ♀ scarcely dilated. *Antennae* stout, basal joint bulbous. *Maxillary palpi* long ; first and second joints short and stout, third long, fourth shorter, fifth as long as the others united. *Anterior wing* with apical forks nos. 1, 2, 3, 4 and 5 ; discoidal cell long ; median cell shorter. *Posterior wing* with forks nos. 1, 2 and 5 ; discoidal cell small and triangular. Sub-costa and radius connected towards the apex and forming a small fork. Abdominal filaments rather long and slender in the ♂.

Type species.—*Hydropsyche senex* Pictet, 1834 (= *Philopotamus conspersus* Curtis, 1834).

Key to Species of *Plectrocnemia*.

1. Male inferior appendages long, slender, upeurved *P. australica* Banks (p. 354).
–. Male inferior appendages short and broad . . *P. maclachlani* sp. n. (p. 355).

Plectrocnemia australica Banks (fig. 244).

Plectrocnemia australica Banks, 1939, *Bull. Mus. Comp. Zool. Harv.*, 85 : 498–499, figs. 65, 69.

Banks describes the species as follows :

" Head brown, with dull golden and black hair ; palpi yellowish-brown, antennae dull yellowish, annulate with pale brownish ; pronotum with mostly

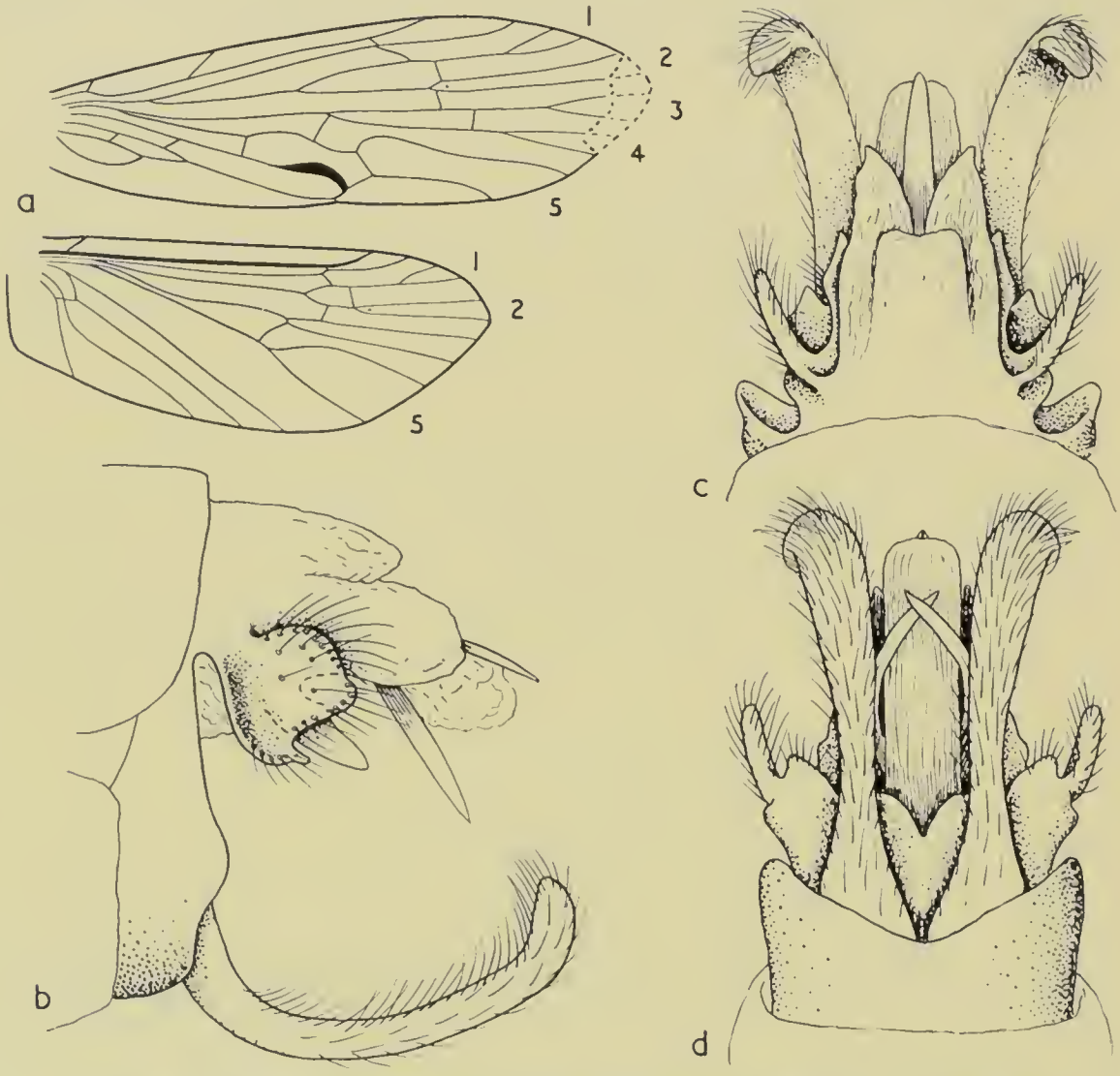

Fig. 244.—*Plectrocnemia australica* Banks. ♂. *a*, wings ; *b*, genitalia, lateral ; *c*, dorsal ; *d*, ventral.

black hair, mesonotum with golden and black hair ; abdomen dark brown ; legs dull yellowish, hind tarsi faintly marked with darker."

" Fore wings gray, with black hair, and with numerous very small patches of golden or yellowish hair, a few larger ones along the costal area, a curved white hyaline line from fork of medius to cubitus ; hind wings gray, with black hair."

" In fore wings discal cell about three times as long as wide, fork one hardly

equal to its pedicel, fork two back a trifle on discal cell, fork three short and with very long pedicel, fork four hardly longer than three, fork five very long and greatly widened at base, more so than in other species."

"In hind wings discal cell small, about twice as long as wide, fork one a little longer than pedicel, fork two back to discal cell, fork five long and very wide."

"Male genitalia show a pair of lower claspers, subparallel and with tips somewhat enlarged, longer than usual and strongly upcurved, a superior median, tapering piece, and beneath it two pieces extending out to tip of claspers or beyond and with sharp points, and on each side a broad, elongate oval piece, tipped with long hairs. There appears to be a median translucent plate, vertical from between the claspers up in a curve."

"Fore wings 7 mm. long."

"From Mt. Kosciusko, New South Wales, Australia, 5000 ft., 8 Dec. (Darlington)."

Type in the Museum of Comparative Zoology, Harvard College, U.S.A.

It is interesting to find that this insect occurs also in Tasmania, an example having been taken by Dr. Tillyard at Cradle Mts., 22.i.1917, and another by Mr. Critchley Parker at Waddamana, River Ouse. A female from S.E. Queensland, Tambourine Mts., 11–17.v.1935, R. E. Turner, probably belongs here. I supplement Banks' description by figures and descriptions made from the Waddamana specimen. The species is remarkable for the unusual thickening of Cu_2 towards its apex in the anterior wing.

[*Genitalia*, ♂.—Dorsal plate membranous, with truncate distal margin. From its lateral margins descends the upper penis-cover, in the form of a pair of lightly chitinized plates with rounded apices, set on edge and, with the dorsal plate, forming a deep hood over the penis. From each lower basal angle of the upper penis-cover arises a rounded, hairy process. In side view there is an excision in the apical margin of this process, its lower margin is curved under, and between this process and the chitinized plates there is a short, pointed finger. Penis with a long, slender, central spine surmounting some apical membrane and flanked by a pair of long, spiniform sheaths directed downward; beneath the penis is a broad plate excised at the centre of its distal margin, probably a lower penis-cover. Inferior appendages very large and strong, curving upward like a pair of elephant's tusks, broadening slightly towards the apices and fringed.—D. E. K.]

Plectrocnemia maclachlani sp. n. (fig. 245).

Insect brownish, of moderate size. *Head* fuscous, clothed with whitish hairs; oculi chocolate. Basal joint of *antenna* rounded, darker in colour than the remaining joints. *Palpi* and *legs* of the paler shade. *Anterior wing* brownish, irrorated. Three rather conspicuous, dark spots along the costal margin before the apex, round the margin of which are two or three smaller and less conspicuous spots. Posterior wing of about the same shade as the ground-colour of the anterior. Sub-costa considerably thickened. *Abdomen* with well-developed hair-like branchiae arising at the pleurites.

Genitalia, ♂.—Apical margin of the eighth tergite straight, that of the ninth obscure. There is a broad, rectangular dorsal plate, membranous and

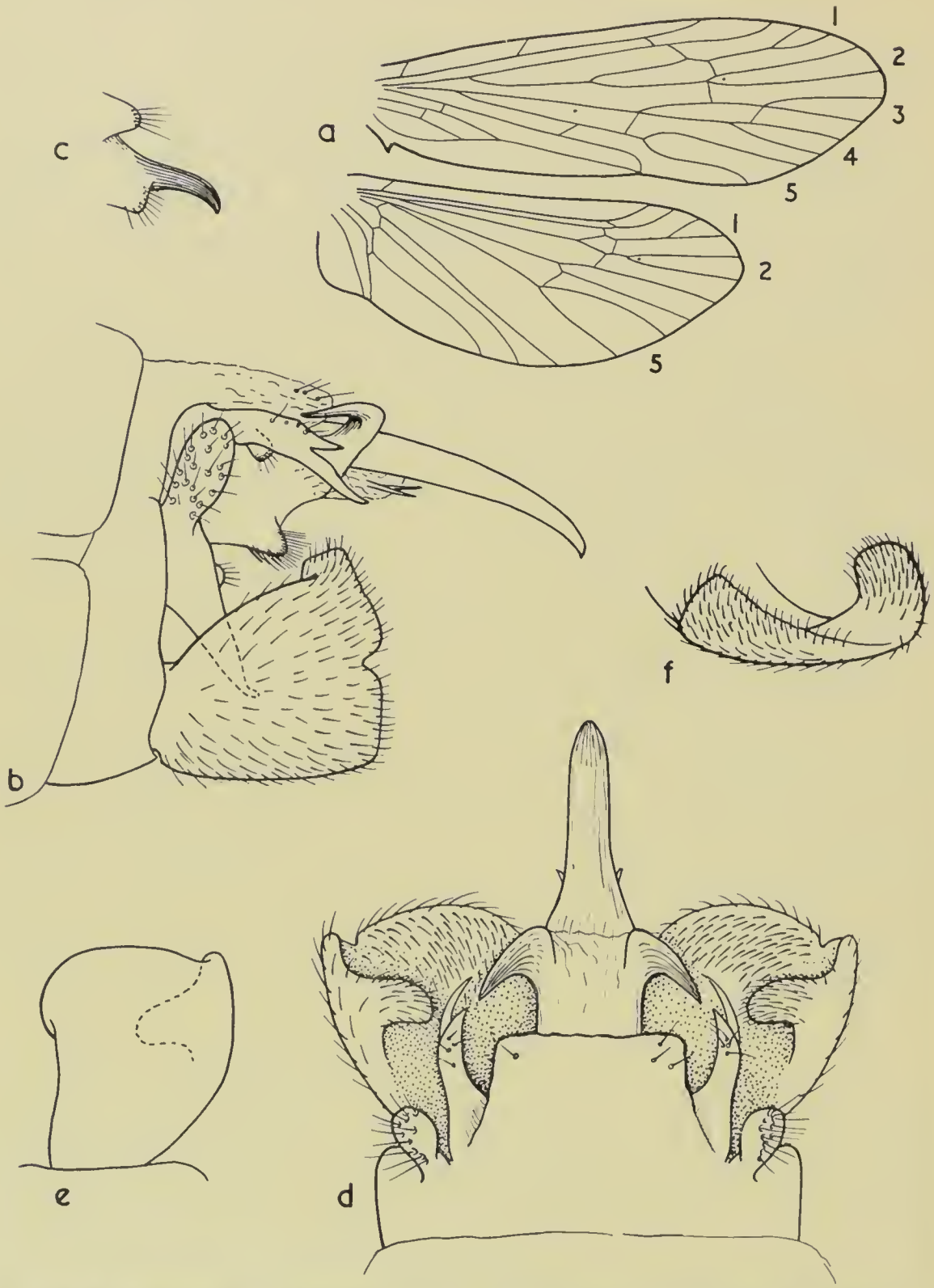

FIG. 245.—*Plectrocnemia maclachlani* sp. n. ♂. *a*, wings; *b*, genitalia, lateral; *c*, upper penis-cover, lateral; *d*, genitalia, dorsal; *e*, inferior appendage, ventral; *f*, inferior appendage from behind.

very transparent, with a pair of processes, which may be superior appendages, arising at its base and terminating in bifurcate claws. Each of these appendages has a small branch arising from its under surface with a clavate apex directed downward. Upper penis-cover attached to the under surface of the dorsal plate, deep, forming a hood on each side of the penis. Its apex is furnished with a pair of large, outwardly and basally curved hooks ; it bears on its under surface a heavily fringed lobe ; at its base arises a large ovate lobe sparsely fringed with hairs, its lower angle sloping downward, ending in an acute apex extending as far as the lower hooks of the lower penis-cover. Penis terminating in a long, central, beak-like process ; lower penis-cover in the form of a pair of downturned hooks with blackened apices. Inferior appendages broad and short, with a broad, truncate apical margin, curved and set with teeth as seen from behind ; upper angles produced to form inturned, clavate processes.

Length of anterior wing, ♂, 6 mm.

New Zealand : Wainuiomata, 1 ♂ (*type*), Hudson, from the McLachlan Collection ; S. Karori, 12.xii.1936, 1 ♀, G. V. Hudson.

A specimen without abdomen from the Roding River, 3000 ft., 29.xii.1925, A. Philpott, may possibly belong here. This species may be easily separated from *P. australica* by the form of the ♂ inferior appendages.

Nyctiophylax Brauer.

Nyctiophylax Brauer, 1865, *Verh. zool.-bot. Ges. Wien.*, **15**:419.
Nyctiophylax Ulmer, 1907, *Gen. Insect.*, **60a**:186.

Spurs 3, 4, 4. Sub-apical spur of anterior tibia situated about midway. *Tibiae* and *tarsi* of ♀ median leg strongly dilated. *Antennae* about as long as anterior wing, stout. *Maxillary palpi* with the first two joints very short, third about as long as first and second together, fourth a little shorter than third, fifth shorter than the other four together. *Anterior wing* with apex rounded. Discoidal cell in both wings closed ; median cell in anterior wing closed. Postcostal area very narrow. Sub-costa and radius in both wings close together. Anterior wing with apical forks nos. 2, 3, 4 and 5 ; posterior wing with only forks nos. 2 and 5 present.

Type species.—*Nyctiophylax sinensis* Brauer, 1865.

This genus is included in the Australian fauna on the evidence of a single male (posterior wings now lacking) in the C.S.I.R. Collection, from N. Australia and a female from Queensland, in the Tillyard Collection.

Nyctiophylax parvus sp. n. (fig. 246).

Insect small, brownish. *Anterior wing* ochraceous, with here and there patches of brown. Posterior wings lacking in the unique example.

Genitalia, ♂.—From above, ninth segment produced in a large, blunt, irregular triangle. Superior appendages arise from narrow stems, gradually dilating to large, clavate apices with truncate distal margins. Penis short. Lower penis-cover furcate, arising from a broad base, each fork with a truncate

margin as seen from beneath, the inner angle produced in a down-turned hook, the forks separated from each other by a wide and somewhat rounded excision. Inferior appendages single-jointed, long, sinuate from the side, lower outer surface at the apex pectinate. From beneath, one or two long stout bristles arise from their slightly serrate margins.

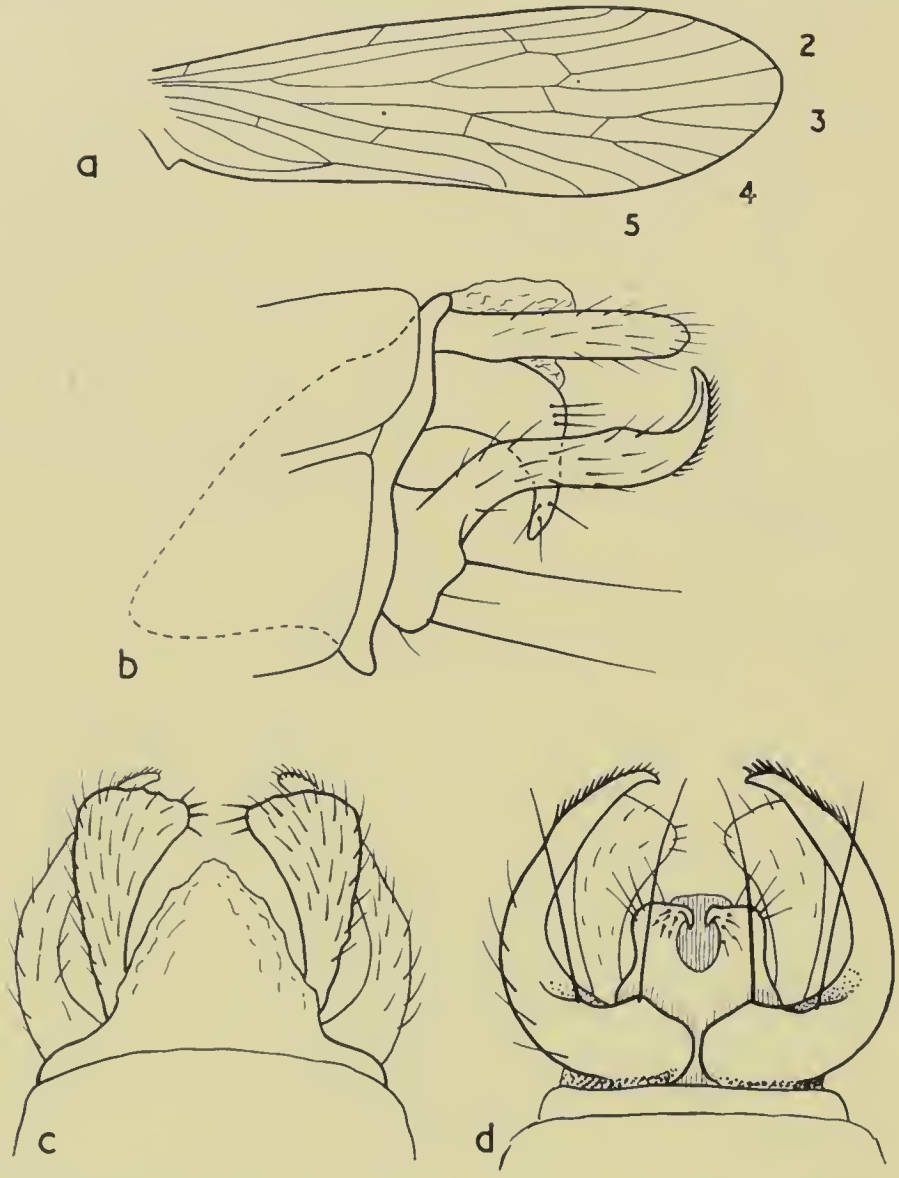

Fig. 246.—*Nyctiophylax parvus* sp. n. ♂. *a*, anterior wing; *b*, genitalia, lateral; *c*, dorsal; *d*, ventral, dorsal plate omitted.

Length of anterior wing, ♂, 3·5 mm.

North Australia: Manbulla Station, Katherine, 19.vii.1929, 1 ♂, I. M. Mackerras and T. G. Campbell.

Type, ♂, mounted in balsam, in the collection of the Council for Scientific and Industrial Research, Canberra.

Nyctiophylax sp., ♀ (fig. 247).

General colour reddish brown, with golden hairs. *Anterior wing* clothed with a mixture of brownish and golden hairs. Membrane and venation brownish, with white spots at the cross-vein below the discoidal cell, at the base of the median cell and on the cross-vein below it, and at the arculus. *Posterior wing* paler and with less dense pubescence.

Length of anterior wing, 8 mm.

Australia : Queensland, 1 ♀, Tillyard Collection.

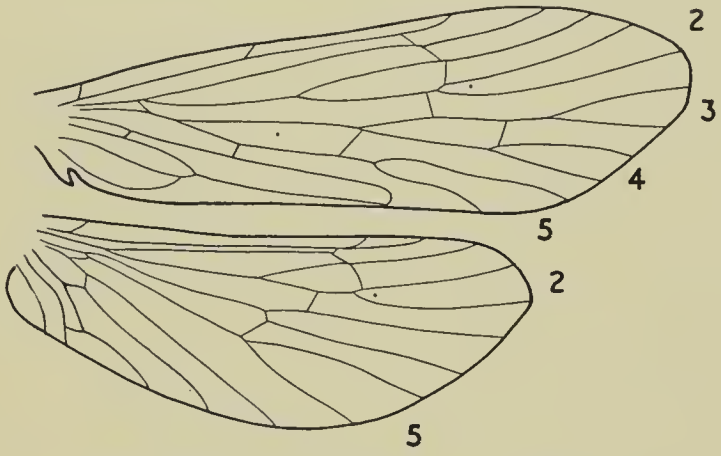

Fig. 247.—*Nyctiophylax* sp. ♀ wings.

Polyplectropus Ulmer.

Polyplectropus Ulmer, 1905, *Stett. ent. Zeit.*, **66** : 103.
Polyplectropus Ulmer, 1907, *Gen. Insect.*, **60a** : 184.

Very similar to *Polycentropus*. *Spurs* 3, 4, 4. *Intermediate tibia* and tarsi of ♀ strongly dilated. *Antennae* short and robust. *Maxillary palpi*, first and second joints short, third longer, fourth shorter, fifth as long as the others united. In the *anterior wing*, forks nos. 1, 2, 3, 4 and 5 present, nos. 1 and 3 with footstalks ; median cell always narrower than discoidal. In the *posterior wing*, forks nos. 2 and 5 present. Cu_2 and 1A not connected by a cross-vein.

Type species.—*Polyplectropus flavicornis* Ulmer, 1905.

Key to Species of *Polyplectropus*.

1. Male inferior appendages from the side slender, finger-like
P. puerilis (McLachlan) (p. 359).
–. Male inferior appendages from the side stout, almost as broad as long
P. lacus-albinae sp. n. (p. 363).

Polyplectropus puerilis (McLachlan) (fig. 248)

Polycentropus puerilis McLachlan, 1868, *Journ. Linn. Soc. Lond. Zool.*, **10** : 204, 213, pl. 2, fig. 8*a–b*.
Polycentropus puerilis McLachlan, 1873, *Ann. Mag. n. H.*, (4) **12** : 41.
Polycentropus puerilis Hutton, 1899, *Trans. N. Zeal. Inst.*, **31** : 245.

Polycentropus puerilis Hudson, 1904, *N. Zeal. Neur.* : 83, pl. 11, figs. 9, 10.
Polyplectropus puerilis Ulmer, 1907, *Gen. Insect.*, 60a : 185, pl. 39, fig. 9.
Polyplectropus puerilis Tillyard, 1926, *Ins. Austr. N.Z.* : 391, pl. 26, fig. 5.

McLachlan describes the species as follows :

" *Head—antennae* pale yellow, with narrow fuscous annulations ; *vertex* black, thickly clothed with blackish hairs, intermingled with a few golden ones ; *front* produced, with a flattened triangular process ; *palpi* fuscescent."

" *Thorax—prothorax* clothed with blackish and golden hairs intermingled ; *mesothorax* fuscous, hairless at sides, but with a central median depression filled with brown hairs ; *metathorax* fuscous, hairless."

" *Wings—anterior wings* rather broad, the apex broadly elliptical, fuscous, thickly clothed with short brown hairs, and thinly sprinkled with pale whitish-yellow dots, some of which on the dorsal margin and at the apex are larger than the others (these dots are few in number and not conspicuous) ; fringes brown, with one or two whitish spaces ; discoidal cell elongate ; apical forks 1, 2, 3, 4 and 5 all present : the first one short, second long, reaching the anastomosis ; third and fourth longer than the first, nearly equal ; fifth as long as the second, but scarcely reaching the anastomosis ; *posterior wings* broader than the anterior, smoky subhyaline with smoky-grey pubescence and fringes ; discoidal cell open ; apical forks 2 and 5 present ; the first two costulae not connected by a veinlet. "

" *Legs* dingy brownish-testaceous ; spurs darker brown."

"*Abdomen* fuscous, somewhat ochreous beneath. In the ♂ there is a narrow elongate testaceous lobe from the apical margin of the last dorsal segment, curved downwards, beneath which are the needle-shaped app. intermed ; app. sup. broad and spoon-shaped, yellow, fringed with long hairs ; app. inf. forming two long finger-shaped yellow lobes, clothed with fuscous hairs. In the ♀ there are two lanceolate and acute hairy inferior valves."

" Long. corp. 2‴ ; exp. alar. 6½–7‴."

" Christchurch, Canterbury (*Fereday*) ; Auckland (*Edwards*)."

Type, ♂, in the British Museum (N.H.).

I add the following to McLachlan's description :

While the series described by McLachlan comprises examples with rather inconspicuous markings, there are others in the British Museum (N.H.) with very strong patterns, particularly along the posterior border. The pattern is well indicated in the coloured plate in the *Genera Insectorum*.

MacLachlan's types are now rather faded, but amongst more recent material presented to the British Museum (N.H.) by Mr. G. V. Hudson are some individuals with the *anterior wings* very dark with conspicuous, silvery-white markings in the post-costal area. In an example denuded for the purpose of this description there is, in the *posterior wing*, a vestigial vein, not reaching the margin, which, if complete, would give a fork no. 3 to this wing. This is evidently an aberrancy, as none of the other specimens, in a fairly long series, shows this character.

McLachlan's description of the genitalia was evidently made from a dried example, so that his figures scarcely give an adequate picture of these complicated structures. I accordingly give a new description and additional figures of these parts.

Genitalia, ♂.—Ninth segment membranous above ; from this aspect it is produced in a membranous dorsal plate with truncate distal margin. From the side and from beneath the distal margin of the ninth segment is excised

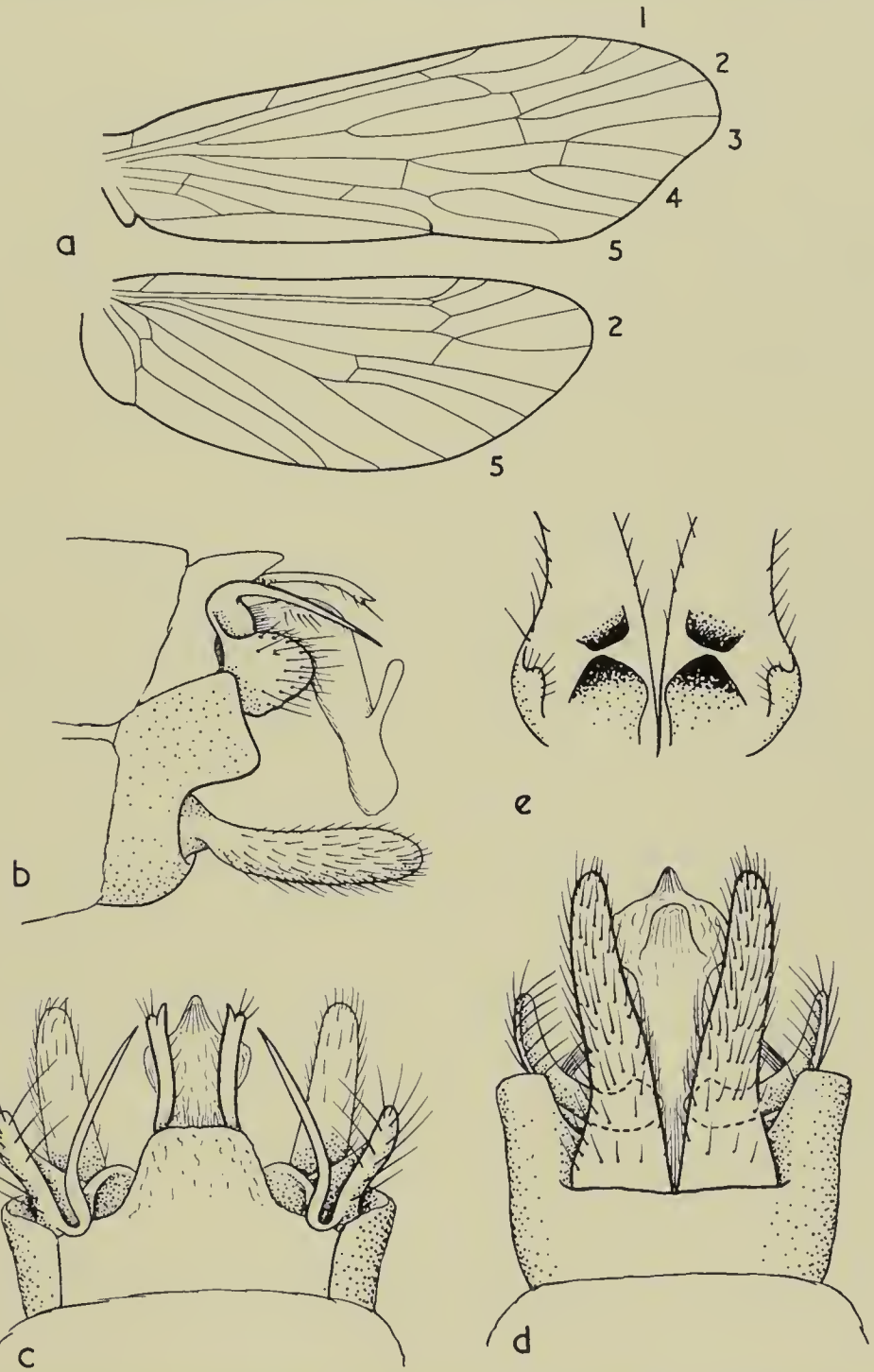

Fig. 248.—*Polyplectropus puerilis* (McLachlan). ♂. *a*, wings ; *b*, genitalia, lateral *c*, dorsal ; *d*, ventral ; *e*, base of inferior appendages from within.

to leave a quadrate upper part ; this upper part reaches to just above the eighth pleurite. Upper penis-cover in the form of a pair of trifurcate appendages, the innermost branch of each immediately beneath the dorsal plate, rod-like, parallel, with forked apices, the inner fork slightly longer and more acute than the outer ; the outer branch, from the side, with a rounded base from which arises a distally directed spine somewhat twisted at its junction with the base. From above, the spines slope towards each other and extend nearly to the apex of the penis ; from below, the lower margins of the outer branches are curved inward beneath the penis. Penis with a rather wide dorsal process arising towards the apex and directed upward from the side. In the excision of the lateral margin of the ninth segment arise the inferior appendages which, from beneath, are long and tapering, from the side, slightly dilated beyond the extreme base and directed distally ; seen from above, on the upper surfaces, at the extreme base are two pairs of small, quadrate plates with blackened outer apical margins which nearly meet.

Hudson's account of the biology of this insect is as follows :

"The larva is found in the streams throughout the year, but is very scarce in the winter and early spring. It is full grown about January."

"When mature it measures about $\frac{3}{4}$ inch in length. The head is large, oval, pale yellow speckled with black ; the three thoracic segments are dull green ; the anterior legs are short, slender, and not specially prehensile in structure ; the other two pairs of legs are also slender, and of moderate length. The abdomen is pinkish-brown, elongate, composed of nine uniform and simple segments, gradually tapering towards the posterior extremity. There is a number of very slender hairs or filaments on the sides of the body. The anal claspers are elongate and very strong. They are composed of three joints : the first is stout and cylindrical, the second is much shorter and slenderer, and the third consists of a very strong and horny hook."

"This larva inhabits very slow-running streams, and is usually found where the "green slime" weed is abundant, amongst which it forms extensive tubular galleries composed entirely of the weed interwoven with its own silk. These galleries often meander over the surfaces of rocks and boulders. They are very difficult to detect, except when distended by the larva as it wriggles to and fro inside the tube. It is, however, generally difficult to find the larva, as it always has to be disengaged from its slimy habitation, and very often escapes during the process. The caddis-worm is not full grown until the middle or end of January ; consequently it inhabits the streams when they are almost at their lowest level, and thus full of the "green slime," amongst which the insect is specially adapted to live."

"This larva is carnivorous, feeding chiefly on smaller insects, which it captures whilst lurking in its secret galleries. When full grown it constructs a large and extremely tough silken cocoon, covered on the outside with numerous minute stones. It is generally situated on the disc of a large boulder, just at the point where the stone is embedded in the sandy detritus of the river-bed. These cocoons are extremely difficult to remove without destroying the contained pupae, and it is quite impossible to extract the insect without injury, owing to the tough, but very elastic, nature of the cocoon, which when pulled in one direction stretches and contracts in the other, thus compressing and injuring the enclosed insect. The cocoons are often very abundant in February, but I have only succeeded in getting one specimen as far as the swimming pupa stage, from which I was able to identify the insect as *P. puerilis*.

Both larva and pupa very speedily die in confinement, the insect being apparently especially susceptible to the ill-effects of the imperfectly aerated water of the ordinary aquarium. The perfect insect appears from November till April. The specimens taken in November appear to emerge from pupae, which have passed the entire winter in their cocoons in the streams; this appears to be a frequent habit with *P. puerilis*, as I have several times found the pupae in streams during the winter."

[Tillyard (1926) records the species from both New Zealand and Australia. I have seen no Australian examples, and it is possible that his record is based on a mis-identification of the following species.—D. E. K.]

Polyplectropus lacus-albinae sp. n. (Kimmins) (fig. 249).

♂. *Head* dark brownish black, with golden hairs. *Antennae* dark brown, annulated with yellowish. *Palpi* brownish, maxillary incomplete in the unique type. *Thorax* dark brown, with golden hairs, legs fulvous. *Wings* dark brownish; anterior with numerous small golden irrorations, and with three or four larger golden spots along the costal margin. *Posterior wing* pale smoky brownish. In the fore wing apical forks nos. 3 and 4 are narrow, 3 with a footstalk, 4 sessile, otherwise neuration much as in *P. puerilis* (McLachlan).

Genitalia.—Ninth segment membranous in its upper half, strongly chitinized below, the upper portion produced in a rather indefinite dorsal plate. Upper penis-cover complex, three-branched, and fused in a narrow band beneath the penis. Seen from the side the upper branch forms a long spine directed tailward and then downward and outward, thin and blade-like basally. The second branch is a small hairy lobe directed outwards, and the third and lowest branch appears as a small, downwardly and outwardly curved hook. From beneath this hook is seen to arise from a broadened, hairy lobe. Penis cylindrical; lower apical margin divided into two rounded lobes with up-curved lateral margins. Inferior appendages from the side large, roundly quadrate; from beneath they are narrowly triangular, the upper apical angle produced inwards in a rounded spinose lobe.

Length of anterior wing, 8 mm.

AUSTRALIA: New South Wales, Mt. Kosciusko, Lake Albina, 6350 ft., 28.i.1930, 1 ♂, R. J. Tillyard.

Type, ♂, with abdomen mounted in balsam.

This species agrees in the general pattern of the male genitalia with *P. puerilis* (McLachlan), but differs in the form of the inferior appendages, the absence of the rod-like branches below the dorsal plate, and in the greater development of the spiniform branch of the upper penis-cover.

Stenopsychodes Ulmer.

Stenopsychodes Ulmer, 1916, *Ark. f. Zool.*, **10**: 5, figs. 7–11.
Stenopsychodes Tillyard, 1922, *Austr. Zool.*, **2**: 76.
Stenopsychodes Tillyard, 1926, *Ins. Austral. N.Z.*: 391.

[*Spurs* 3, 4, 4. Sub-apical spurs of the anterior and median tibiae about midway or a little before, those of the posterior tibiae somewhat beyond

the middle. *Legs* long, middle and hind legs (particularly the former) with the tibiae and tarsi broadened and flattened, even in the male. *Antennae* strong, laterally compressed, longer than the fore wings, the joints short and

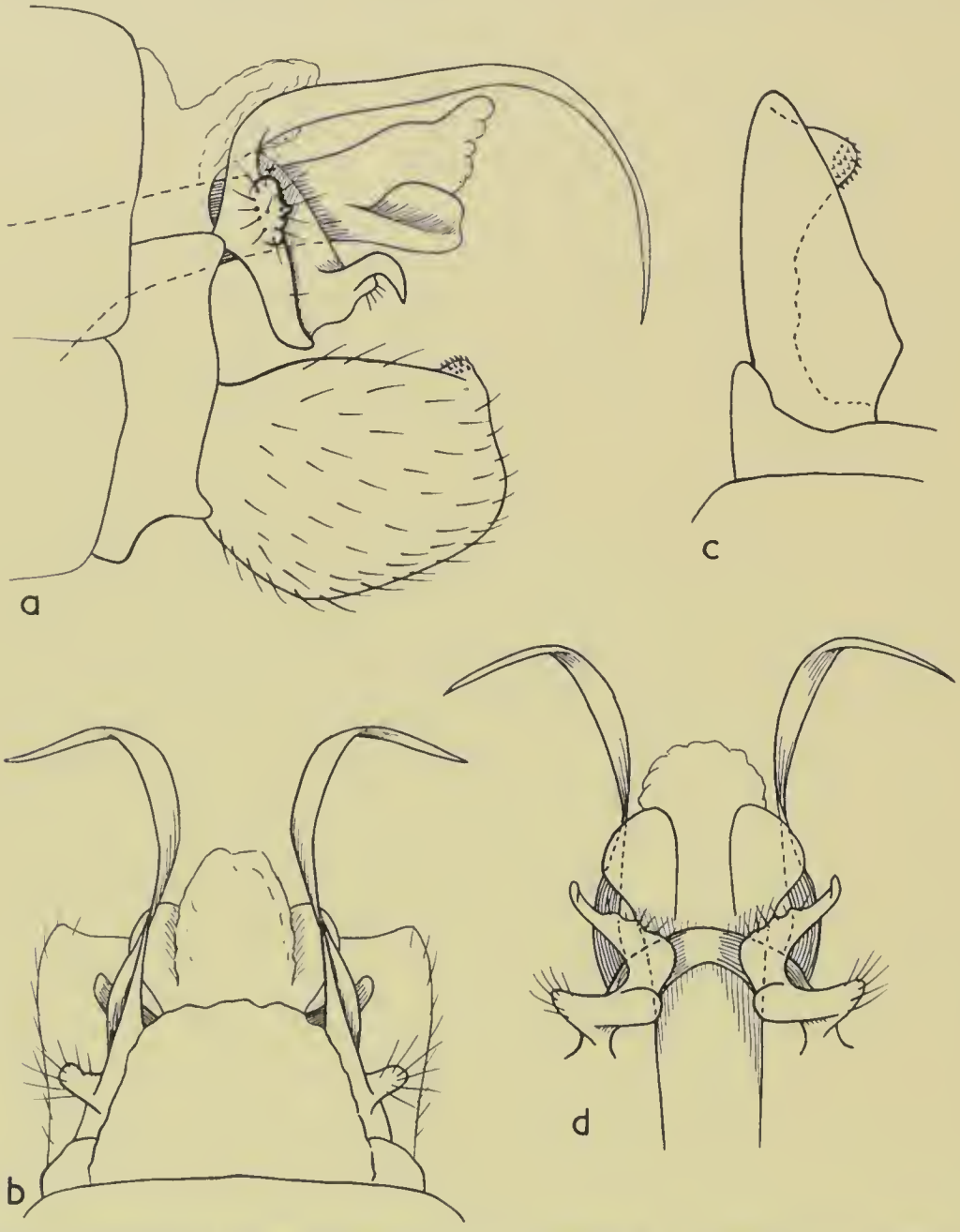

FIG. 249.—*Polyplectropus lacus-albinae* sp. n. ♂ genitalia. *a*, lateral; *b*, dorsal; *c*, inferior appendage, ventral; *d*, upper penis-cover and penis, ventral.

feebly notched. *Maxillary palpi* with the first two joints short, somewhat thickened; the third joint long; fourth about two-thirds as long as the third; fifth as long as the others combined, its apex acutely ovate, not very distinctly articulated. Labial palpi short, terminal joint about as long as the

two basal joints. In the type species the *haustellum* and *labrum* are unusually long and narrow, but in some other species they are of normal size. Eyes swollen but not very large, the distance between them greater than the diameter of the eye. *Ocelli* wanting. Dorsal surface of the head feebly convex, with a small wart between the antennae and another at the base of each antenna, and a pair of larger warts on the back of the head.

Wings moderately broad, densely pubescent; anterior wing generally dark brown with yellow spots. Anterior wing with two costal cross-veins, a somewhat elongate discoidal cell, a longer median cell and an even more elongate thyridial cell. Forks nos. 1, 2, 3, 4 and 5 present. First apical vein connected to the radius by a cross-vein near its base. Posterior wing with similarly formed discoidal and closed median cell. Forks nos. 1, 2, 3 and 5 present. First apical vein joined by a cross-vein to the radius.

♂ *genitalia* elongate, with long, slender superior appendages. Upper penis-cover with two or three pairs of spine-like processes. Penis stout. Inferior appendages large, single-jointed; side-pieces of the ninth segment large.

♀ with the tenth tergite produced in a cornute process.

Type species.—*Stenopsychodes mjöbergi* Ulmer, 1916.

Tillyard, quoting Ulmer, gives the produced rostrum as a generic character. His own species, *S. montana* and the new *S. venusta*, do not, however, show this character. He also gives the upper penis-cover as having two pairs of branches, whereas in the type of *S. montana* and in *S. venusta* there are actually three pairs of branches.—D. E. K.]

Tillyard records that the larvae of *Stenopsychodes* live in fast mountain streams.

Key to Species of *Stenopsychodes*.

1. Anterior wings fawn, with pale fuscous reticulation *S. hiemalis* Tillyard (p. 365).
–. Anterior wings marked with yellow or gold on a black or brown ground . . 2.
2. Anterior wing-pattern mainly composed of rounded yellow spots on a dark ground . . . . . 3.
–. Anterior wing-pattern composed of bold, irregular yellow blotches on a dark ground . . . . . *S. melanochrysa* Tillyard (p. 367).
3. Inferior appendages of ♂ with inner margin acutely produced to form an inner hook . . . . . 4.
–. Inferior appendages of ♂ with inner margin not acutely produced . . . 5.
4. Upper branch of upper penis-cover nearly as long as lower *S. tillyardi* Banks (p. 371).
–. Upper branch of upper penis-cover much shorter than lower branch *S. mjöbergi* Ulmer (p. 368).
5. Superior appendages about as long as inferiors . . *S. montana* Tillyard (p. 373).
–. Superior appendages longer than inferiors . . . *S. venusta* sp. n. (p. 375).

Stenopsychodes hiemalis Tillyard (figs. 250, 251).

Stenopsychodes hiemalis Tillyard, 1922, *Aust. Zool.*, 2 : 79–80, pl. 24A, fig. 2, text-figs. 1, 3, 4.

Stenopsychodes hiemalis Tillyard, 1925, *Ins. Austral. N.Z.* : 391, pl. 26, fig. 7.

Tillyard describes the species as follows :

" ♂. *Total length* 11·8, *forewing* 17, *hindwing* 13·2, *expanse* 35·5 mm."

" Head, thorax and abdomen yellowish brown ; *antennae*, *legs* and *appendages* the same colour : *eyes* greyish black : *occiput* only slightly swollen behind. Length of hindleg 18 mm."

" Wings : *Forewings* with a very close and delicate reticulation of pale fuscous on a ground-colour of fawn, the costal margin and the space between the anal veins and posterior border less infuscated, and hence appearing paler and more definitely fawn-coloured than the rest. All the main veins medium fuscous, except R, which is much paler, and the anal veins, which are darker. *Hindwings* pale semi-transparent fawn-colour, the veins slightly darker."

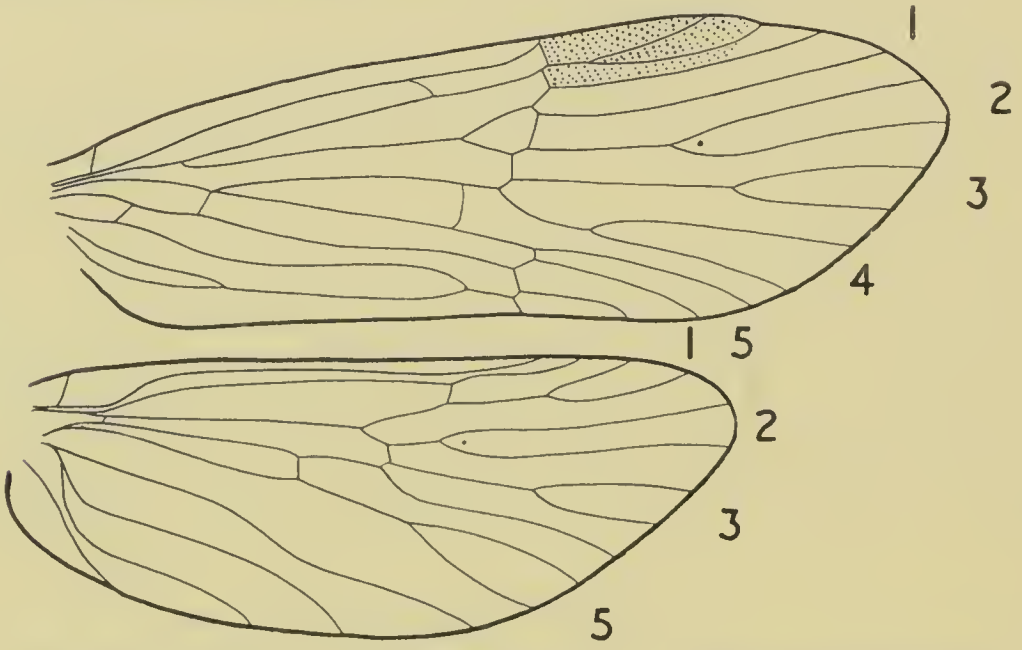

Fig. 250.—*Stenopsychodes hiematis* Tillyard. ♂ wings (after Tillyard).

"Appendages : these are on the same plan as in *St. montana*, but differ in the following points :—Tenth tergite not truncated apically : the longer pair of apoterga extremely slender, only slightly longer than the gonapophyses, beyond the ends of which their sharply pointed tips diverge widely upwards and outwards : the shorter pair very slender, nearly as long as the penis. Preanal appendages very slender, nearly straight, slightly hairy. Penis subcylindrical, the apex bent slightly downwards, apparently without titillators. The broad lateral processes from the ninth sternite are not so closely appressed to the gonapophyses, and their ventral border carries a definite bulge near the middle."

" ♀. Closely resembling the male in size and markings, but darker. *Antennae* 20 mm. (those of the male are broken), dull reddish brown beneath, yellowish brown above. *Thorax* and *abdomen* rather dark brown. *Forewing* more deeply infuscated than in male, but the space between anal veins and posterior border bright fawn-colour : above this, all the space between cubitus and anals is very darkly infuscated. *End of abdomen* with tenth tergite prolonged as shown in fig. 251c."

" Habitat : Hornsby, N.S.W., Australia. Only found in August."

"*Types.* Holotype ♂ and allotype ♀ (Hornsby, August 25th, 1917, R. J. T.) in the Tillyard Collection" [now in the British Museum (N.H.).]

The Tillyard Collection suffered severely from the depredations of pests when in Canberra and, unfortunately, of these two types only a single anterior wing remains of the male and one pair of wings of the female.

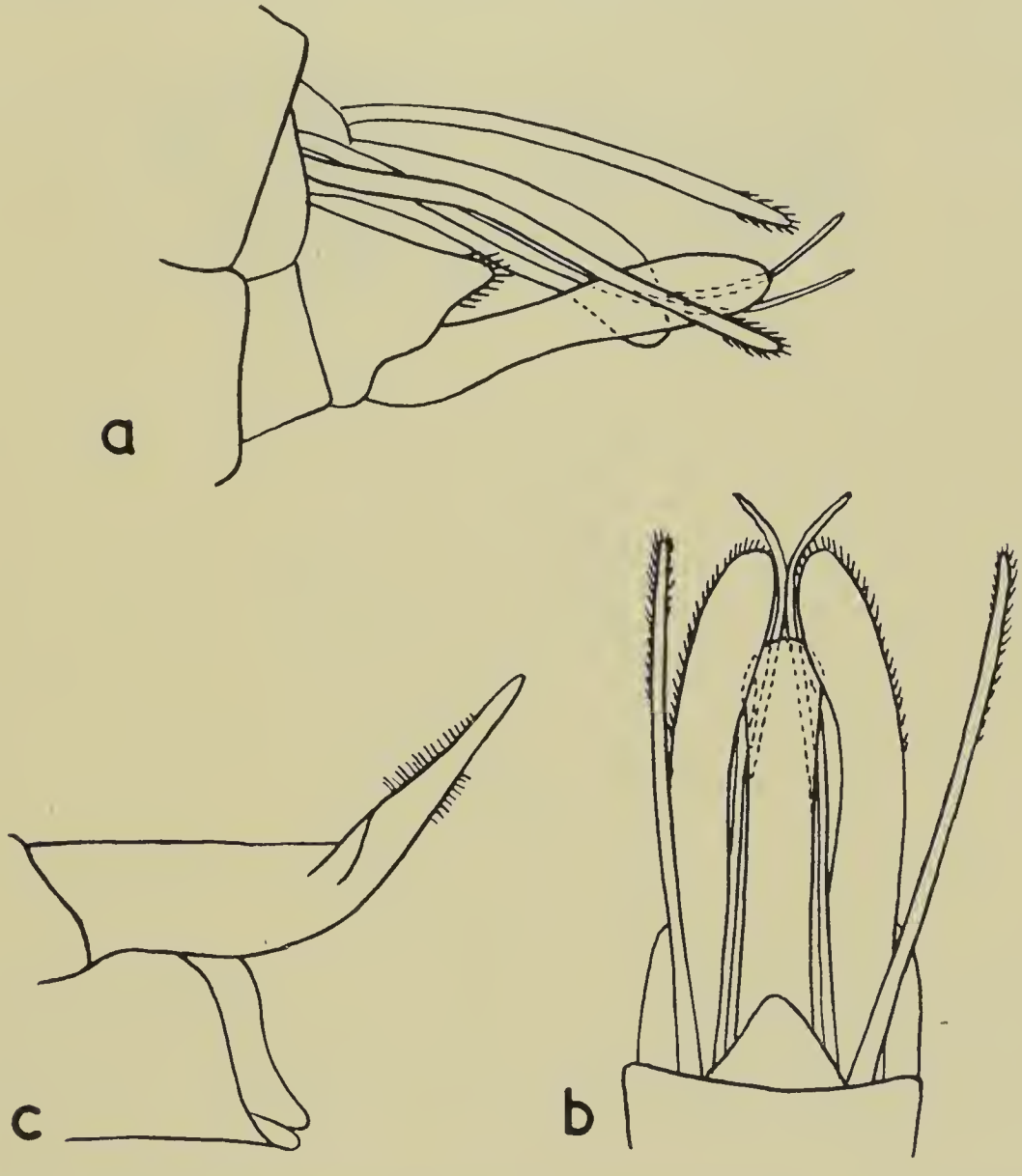

Fig. 251.—*Stenopsychodes hiemalis* Tillyard. ♂♀ genitalia (after Tillyard). *a*, ♂ lateral; *b*, ♂ dorsal; *c*, ♀ lateral.

Stenopsychodes melanochrysa Tillyard (fig. 252).

Stenopsychodes melanochrysa Tillyard, 1922, *Aust. Zool.*, 2 : 81–82, figs. 5, 6.
Stenopsychodes melanochrysa Tillyard, 1926. *Ins. Austral. N.Z.*, : 391, pl. 11, fig. 22.

Tillyard describes the species as follows :

" ♀. *Total length* 12, *forewing* 16·3, *expanse* 34 mm."

" *Head*, *thorax* and *abdomen* jet black. *Antennae* (broken) with basal segment black. *Legs* dull blackish. *End of abdomen* produced into a dark brown, somewhat spoon-shaped process formed from the tenth tergite ; ninth tergite carrying a fringe of long hairs."

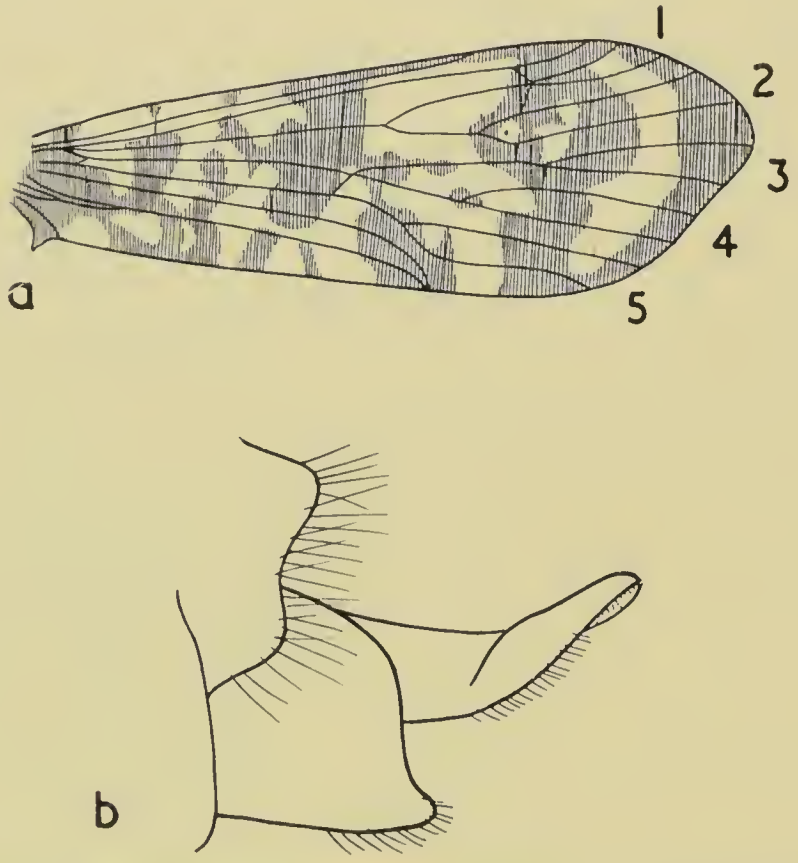

Fig. 252.—*Stenopsychodes melanochrysa* Tillyard. ♀. *a*, anterior wing ; *b*, genitalia, lateral.

" Wings : *Forewing* densely covered with short hairs ; colour rich gold and black, arranged in a bold and irregular pattern. *Hindwing* black, with an irregular streak of gold along costa spreading downwards beyond half-way to form an irregular blotch of gold embracing the fork of Rs and nearly touching M."

" Habitat : Dorrigo, N. S. W. Two females only."

" *Types.*—Holotype ♀ (Dorrigo, W. Heron, undated), in Coll. South Australian Museum, Adelaide. Paratype ♀ in Cawthron Institute collection, Nelson, N. Z. Both specimens are, unfortunately, much damaged."

Stenopsychodes mjöbergi Ulmer (figs. 253, 254).

Stenopsychodes mjöbergi Ulmer, 1916, *Ark. f. Zool.*, **10** (13) : 8–9, figs. 8–11.
Stenopsychodes mjöbergi Tillyard, 1922, *Austral. Zool.*, **2** : 78.

The following is a free translation of Ulmer's description :

The whole body black, but *head*, *pronotum*, and two parallel, shallow furrows and behind them two warts on the *mesonotum* golden yellow. Clothing of head and what can be seen of the sternum golden yellow or golden red ; the warts at the base of the anterior wings also golden red. *Antennae*, *palpi*

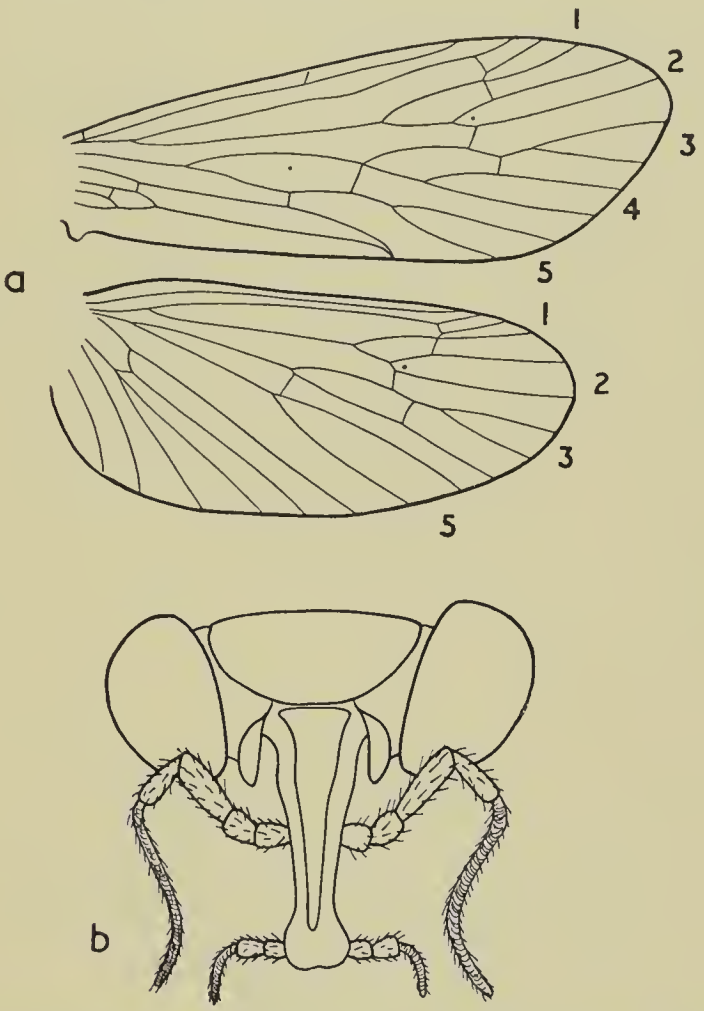

Fig. 253.—*Stenopsychodes mjöbergi* Ulmer. ♂ (after Ulmer). *a*, wings ; *b*, head.

and *legs* dull black, the terminal joint of the tarsi lighter, brownish. *Abdomen* dull black, lighter at the base. *Anterior wing* thickly sprinkled with round, golden yellow spots, particularly between the veins, somewhat as in *Philopotamus ludificatus* but much more regularly ; the colouring occurs not only on the vestiture but extends also to the membrane itself. Apical margin of the wing dark brown, veins and fringes dark brown, thyridium hyaline. *Posterior wing* dull greyish brown, with close, dark brown vestiture. Veins and fringes dark brown, thyridium hyaline. The *genitalia* of the male are primitive and not unlike those of *Stenopsyche*. Superior appendages very

long, dark, at the apices slightly curved inwards and upwards. Upper penis-cover is short, plate-like, quadrangular, and bears two pairs of yellow-brown, backwardly directed, chitinous spines; the upper pair straight, about half

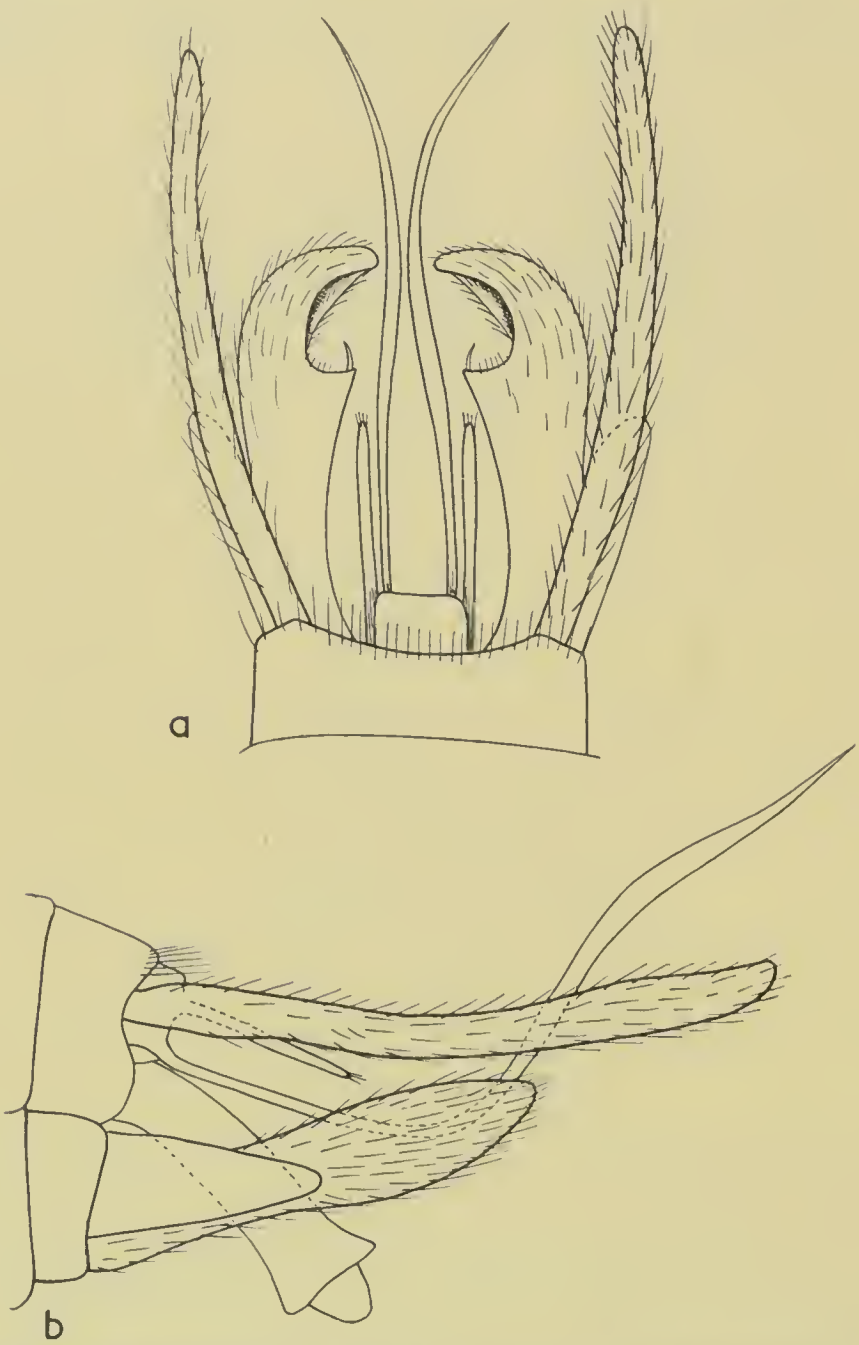

FIG. 254.—*Stenopsychodes mjöbergi* Ulmer. ♂ genitalia (after Ulmer). *a*, dorsal; *b*, lateral.

as long as the inferior appendages, with a few hairs at the apex; the lower pair extraordinarily long, about twice as long as the inferior appendages, running at first parallel to the upper pair of spines, then curved upwards in a

wide sweep ; at the apex feebly sinuous, acute. Penis stout. Inferior appendages form long plates, broadest in the apical third, then tapering to bluntly triangular apices. Inner surfaces concave. From above the inner upper margin is produced inwards, with a deep, rounded excision in the apical third, the basal margin of the excision forming a sharp angle with the inner margin of the appendage. Side-pieces long, triangular. Side-pieces, superior and inferior appendages blackish, with blackish hairs.

Body length, 10 mm. ; length of anterior wing, about 13 mm. ; expanse, 28 mm.

Australia : Queensland, Bellenden Ker, Mjöberg. 2 ♂ (*types*) in Stockholm Museum.

Fig. 255.—*Stenopsychodes tillyardi* Banks. ♂ genitalia (after Banks). *a*, lateral ; *b*, dorsal.

Stenopsychodes tillyardi Banks (fig. 255).

Stenopsychodes tillyardi Banks, 1939, *Bull. Mus. Comp. Zool. Harv.*, 85 : 497, fig. 60.

Banks describes the species as follows :

" Head yellow, clothed with golden hair ; antennae brown, basal joint yellowish, palpi black ; thorax black, pronotum with golden hair, and along middle of mesonotum, and a tuft of golden hair at base of fore wing ; abdomen black, superior appendages pale,others black, on venter three segments near tip pale with a darker central triangle (similar to male *melanochrysa*) ; legs black, tarsi paler. spurs yellowish to brown. Wings black, with short black hair ; fore wings with numerous golden spots between veins, and the anal area almost wholly golden only a few slight dark interruptions."

" Fore wings with discal cell nearly four times as long as broad. fork one back a little on discal cell, fork two back one half way on discal cell, fork three with a pedicel one half its length. forks four and five are nearly equal. pedicel of five about two thirds of pedicel of four."

" In hind wing discal cell is rather more slender, fork one scarcely back on discal,

fork two back one half way on discal cell, fork three with pedicel fully one half its length, fork five very large and long. The male genitalia are most like *S. mjöbergi*

FIG. 256.— *Stenopsychodes* spp. ♀♀. (Photo. D. E. K.) *a*, *S. montana* Tillyard. × $2\frac{2}{3}$; *b*, *S. venusta* sp. n. × 3.

Ulmer; the lateral appendages are more rounded at tip, the ventral appendages, from side to side, have the apical part more slender, and, from above, also more slender and longer, the inner hook very large and nearer base then in *mjöbergi*."

" Fore wing ♂ 12 mm. long, ♀ 15 mm. long."
" From Millaa Millaa, Atherton tableland, 2500 ft., Queensland, Australia, April, 1932 (Darlington)."

Type in the Museum of Comparative Zoology, Harvard College, U.S.A.

Stenopsychodes montana Tillyard (figs. 256*a*, 257, 258).

Stenopsychodes montana Tillyard, 1922, *Aust. Zool.*, 2 : 78–79, pl. 24A, fig. 1, text-fig. 2.
Stenopsychodes montana Tillyard, 1926, *Ins. Austral. N.Z.*, : 391, pl. 26, fig. 6.

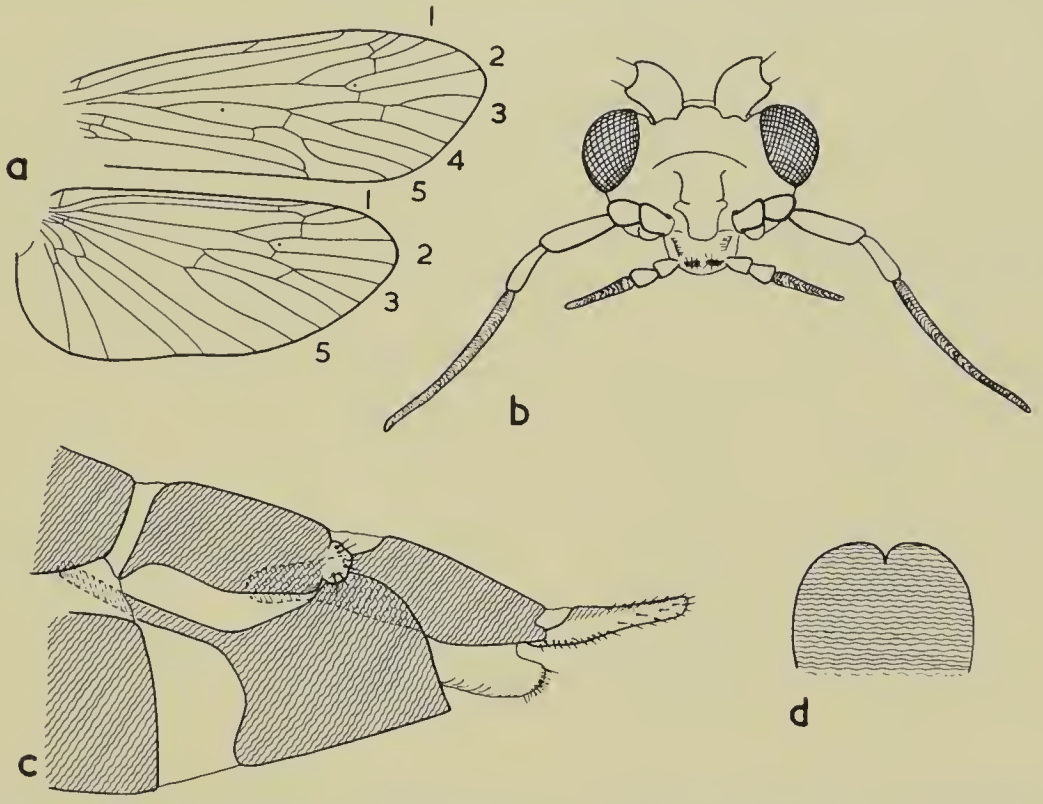

FIG. 257.—*Stenopsychodes montana* Tillyard. *a*, wings ; *b*, head ; *c*, ♀ genitalia, lateral ; *d*, ♀ eighth sternite, ventral.

Tillyard describes the general appearance as follows :

" ♂. *Total length*, 10·2, *forewing* 11, *hindwing* 9·5, *expanse* 24 mm."
" Head black, with sparse golden hairs, a conspicuous patch of bright golden hairs between antennae. *Occiput* much swollen behind. *Antennae* (broken off) with basal segment black, somewhat swollen. *Eyes* greyish black. *Palpi* dull blackish."
" Thorax black with sparse golden hairs on nota. *Legs* dull blackish."
"Abdomen slender cylindrical, black. *Appendages* rich brown, except basal two-thirds of gonapophyses, which are blackish."
" Wings : *Forewings* with all the veins outlined in black on a rich fulvous ground colour ; distal border from beyond pterostigma around apex to tornus continuously margined with black, most deeply at apex itself. Numerous cross-bars of black

connect all the veins, except in the basal half of the costal space, thus giving the wing a closely reticulated appearance. *Hindwings* paler, semi-transparent fulvous, the distal border and cross-veins fuscous."

"*Type*: Holotype ♂ (Katoomba, N. S. W., 3300 ft., Nov. 16, 1912, R. J. T.)."

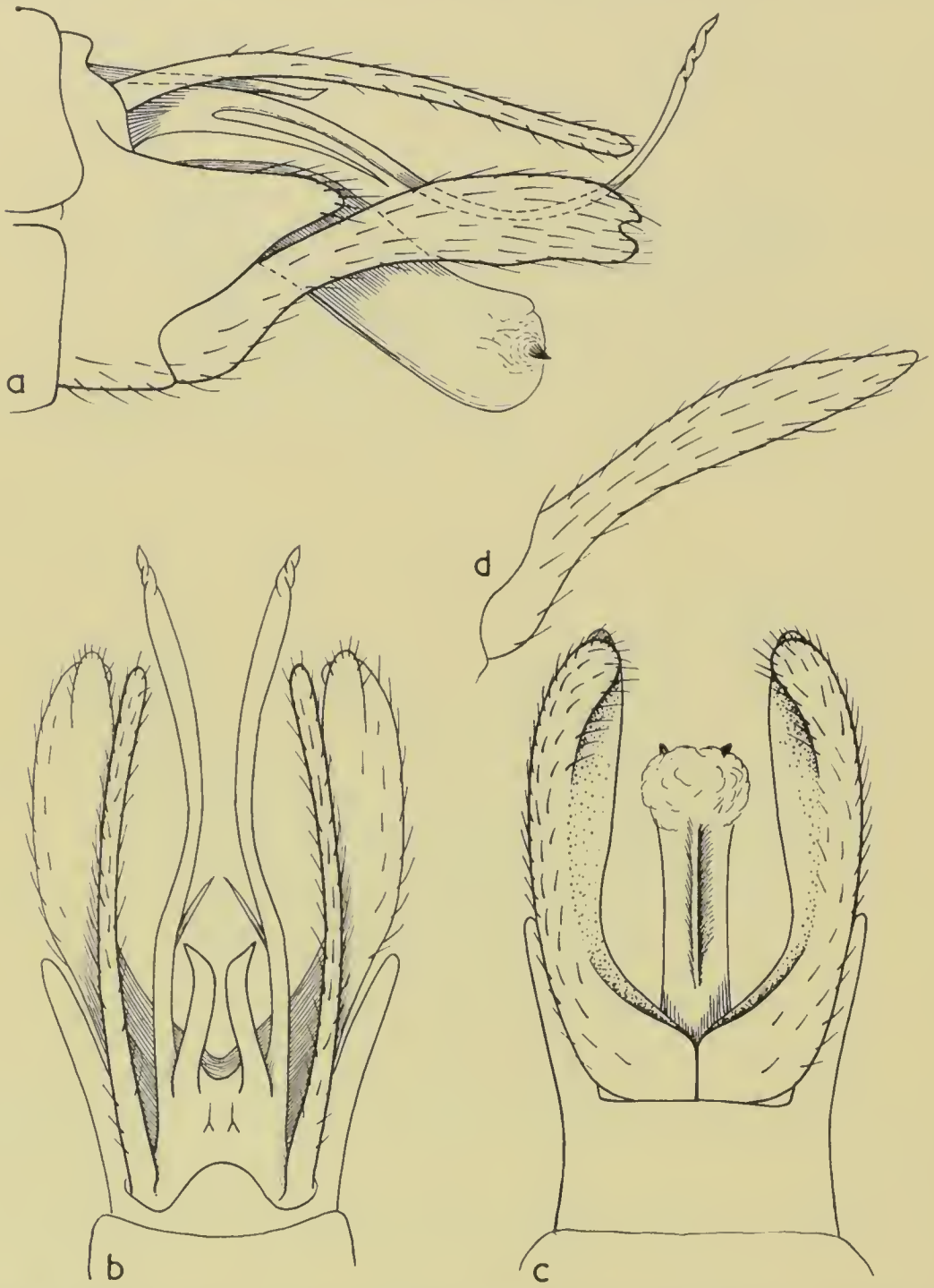

FIG. 258.—*Stenopsychodes montana* Tillyard. ♂ type genitalia. *a*, lateral; *b*, dorsal, penis omitted; *c*, inferior appendages and penis, ventral; *d*, inferior appendage, lateral, from Mt. Kosciusko example ♂.

Type now in the British Museum (N.H.).

[The *abdomen* and *head* of the *type* have been cleared in KOH and mounted in Canada balsam. The ♂ *head* is not produced forward into a long rostrum as stated by Tillyard in his generic diagnosis, but is relatively normal. The *genitalia* differ in some respects from the figures and description given by Tillyard, and new figures and description have been made.

Eighth tergite with its apical margin somewhat thickened and widely excised. Ninth segment shorter above than below ; lateral margins produced in large triangular side-pieces, about half as long as inferior appendages. Superior appendages long, slender and slightly curved ; apices extending to about apices of inferior appendages. Upper penis-cover (apoterga of Tillyard) consisting of three pairs of branches, the upper short, about as long as side-pieces, from above rather broad, with acute apices. Second pair very long, spine-like, from side curving upward to spirally twisted apices. Third and lowest pair of branches much shorter, slender and spine-like. Penis stout, cylindrical, with a median ventral keel towards the apex, which is membranous and carries two short acute processes. Inferior appendages long, curved and stout, dilating towards the apex, which has a small rounded excision, dividing it into an upper and a lower portion ; inner surface of appendage concave.

♀. Eighth tergite with the apical margin produced on each side in a small hairy lobe, and its basal angles acutely produced basally. Eighth sternite with the upper basal angles produced basally in long slender apodemes, apical margin of the sternite rounded, with a small, acute, median excision. Ninth tergite slender, hood-shaped, basal angles forming blunt apodemes. Ninth sternite membranous, hairy at its apex. Tenth tergite slender, tapering to a rounded apex.

Tillyard gives as habitat " Blue Mountains and Monaro Plateau, N.S.W. ; mountains of Victoria and South Australia." In addition to the type I have seen examples from the following localities :—New South Wales : Katoomba, Nov., 1921 ; Bathurst, 3000 ft., Nov., 1884 ; Tidbinbilla, Jan., 1935 ; Mt. Kosciusko, Digger's Creek, 5000 ft., Dec., 1932.

In the ♂ from Digger's Creek, the inferior appendage (fig. 258*d*) has the apex rounded and tapered, without any apical excision, but in other respects the genitalia are typical. Should this deviation from normality prove to be constant in this locality, it might perhaps be necessary to separate it from *montana*, but with little material available I will do no more than draw attention to the fact.—D. E. K.]

Stenopsychodes venusta sp. n. (Kimmins) (figs. 256*b*, 259).

Head, *antennae*, mouth-parts, *body* and *legs* piceous. Head and thorax with sparse golden hairs. Mouth-parts normal, not produced in a rostrum. *Anterior wing* clothed with dark brown and golden pubescence, the gold hairs forming irrorations as in fig. 256*b*. The membrane is brownish, pale yellowish under the golden irrorations. *Posterior wing* clothed with golden pubescence, except at the apex and over some of the apical cross-veins, where it is brown. *Neuration* much as in *S. montana*.

Genitalia, ♂, very closely resembling that of *S. montana*, and the differences can best be indicated by giving a comparative description. Side-pieces of the ninth segment shorter, apices more bluntly rounded, about one third as long as inferior appendages. Superior appendages very long and slender.

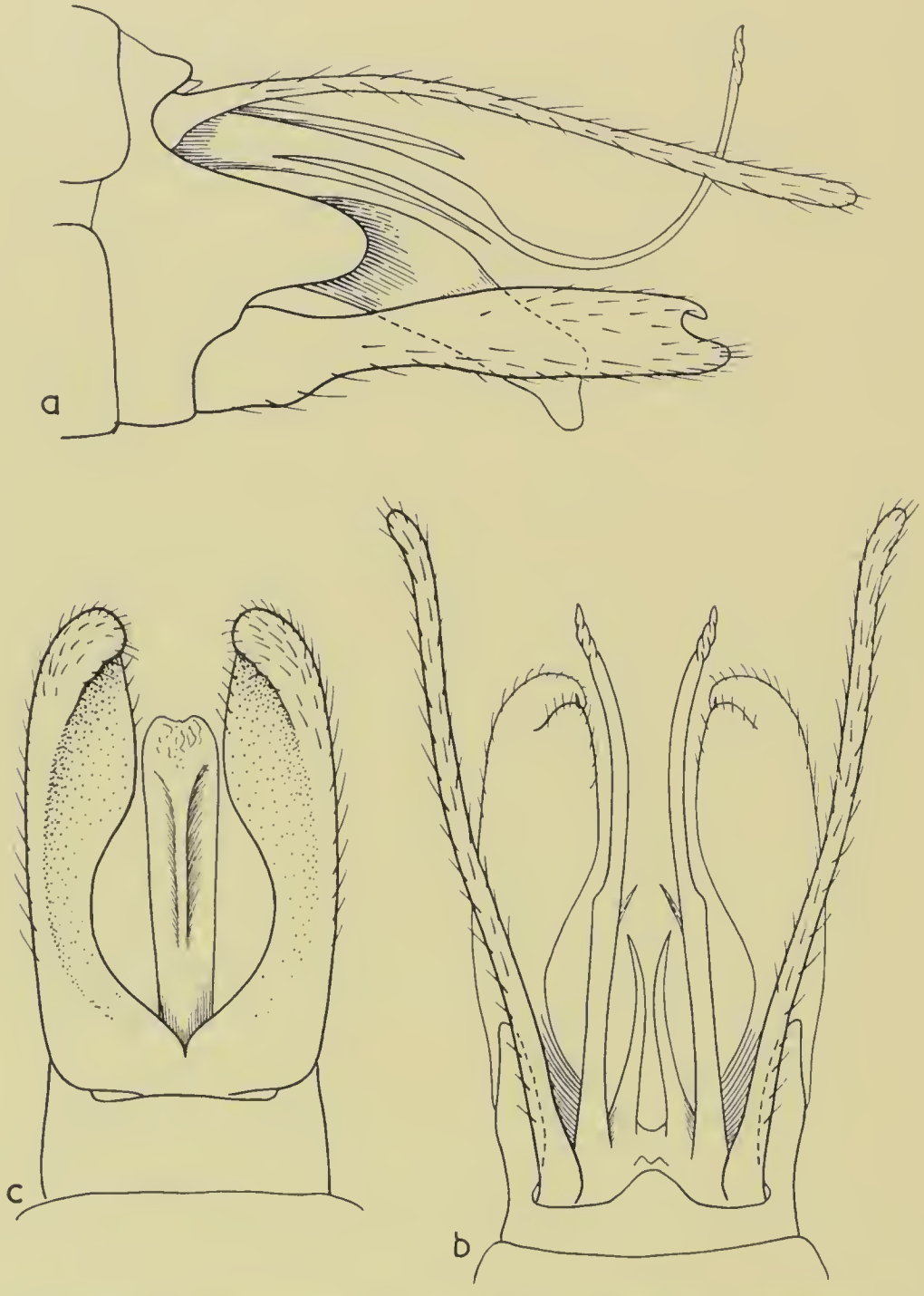

FIG. 259.— *Stenopsychodes venusta* sp. n. ♂ genitalia. *a*, lateral ; *b*, dorsal ; *c*, ventral.

extending well beyond the apices of the inferior appendages. Upper penis-cover similar. Penis with the short acute processes withdrawn within the stem. Inferior appendages from the side almost straight, apex excised, lower angle projecting beyond the upper. From below, the inner margin is more convex in its apical half.

Length of anterior wing, ♂, 11 mm. ; ♀, 14 mm.

AUSTRALIA : F.C.T., Lee's Springs, 19.x.1932, R. J. Tillyard.

Type, ♂, paratype, ♂♀, in the C.S.I.R. Collection, Canberra ; 1 ♀, paratype, in the British Museum (N.H.), presented by the C.S.I.R.

This species is closely related to *S. montana* Tillyard, and the ♂ genitalia do not differ greatly. It is a more handsomely marked insect, the golden pubescence being brighter and the spots on the anterior wing larger and less regular. In *montana* the apex of the anterior wing is without golden spots, whereas in *venusta* there is a row of golden spots close to the wing margin at the apex, with a tendency to the formation of a brown band within them. In the posterior wing the golden pubescence is brighter and the brown apical patch larger. The ♂ genitalia differ chiefly in the relatively greater length of the superior appendages, the shorter, more rounded side-pieces and slightly more dilated inferior appendages.

14. Fam. **PSYCHOMYIDAE** Kolenati.

Psychomyidae, Kolenati, 1859, *Gen. et Spec. Trich.*, **2** : 68.
Polycentropidae (partim, *Ecnominae*), Ulmer, 1907, *Gen. Insect.*, **60a** : 189.
Psychomyidae, Ulmer, 1907, *l.c.* : 191.
Psychomyidae Lestage, 1926, *Bull. Ann. Soc. ent. Belg.*, **65** : 363.

Spurs 2, 4, 4 or 3, 4, 4. *Antennae* not longer than the wings. Basal joint shorter than the head. *Ocelli* absent. *Maxillary palpi* five- or six-jointed. Labial palpi three- or four-jointed ; when the smaller number, the terminal joint is always articulated. *Anterior wing* usually densely pubescent. Discoidal cell small. Apical forks nos. 1, 2, 3, 4 and 5 or 2, 3, 4 and 5 or 2 and 4 present. R_1 sometimes forked. *Posterior wing* shorter and narrower than anterior wing. Apical forks nos. 2, 3 and 5 or 2 and 5 present ; discoidal cell usually absent (present in *Ecnomina*).

This family has been divided by Lestage into three subfamilies. The *Paduniellinae*, characterized by the separation of the terminal joint of the maxillary and labial palpi into two (maxillary palpi six-jointed, labial four-jointed), have not been recorded from the Australian region. Of the other two subfamilies, the *Ecnominae* have been separated from the *Psychomyinae* by the presence of all five apical forks in the anterior wing and a spur-formula of 3, 4, 4. Mosely has since shown that the spur-formula in *Ecnomus* can be either 3, 4, 4 or 2, 4, 4, and now a genus has been discovered in the Australian region in which apical fork no. 1 is lacking in the anterior wing. Thus the accepted subfamily characters have broken down, but I think it is possible to retain these subfamily divisions by using modified characters, as follows :

1. Maxillary palpi six-jointed, labial four-jointed . . . *Paduniellinae* Lestage.
(Not yet recorded from Australian region.)
–. Maxillary palpi five-jointed, labial palpi three-jointed . . . . . 2.
2. In anterior wing R_1 is forked, and R_2 and R_3 are separate at the wing margin, or at least one of these characters is present. Spurs 3, 4, 4 or 2, 4, 4
Ecnominae Ulmer (p. 378).
–. In anterior wing R_1 is not forked and R_2 and R_3 are always fused. Spurs 2, 4, 4
Psychomyinae Ulmer.
(Not yet recorded from the Australian region.)

Key to Australian Genera of *Ecnominae*.

1. Fork no. 1 present in anterior wing; no discoidal cell or fork no. 3 in posterior wing . . . . . *Ecnomus* McLachlan (p. 378).
. Fork no. 1 wanting in anterior wing; discoidal cell and fork no. 3 present in posterior wing . . . . . *Ecnomina* gen. n. (p. 380).

Ecnomus McLachlan.

Ecnomus McLachlan, 1864, *Ent. Mon. Mag.*, 1 : 30.
Ecnomus Ulmer, 1907, *Gen. Insect.*, 60a : 190.
Ecnomus Mosely, 1932, *Trans. Ent. Soc. Lond.*, 80 : 16.

Spurs 3, 4, 4 or 2, 4, 4. *Maxillary palpi*, first joint very short, second slightly longer, third a little longer than the second, fourth slightly longer than the third, fifth about as long as the second to the fourth together. *Anterior wing* greyish, generally irrorated. R_1 forked at apex. Apical forks nos. 1, 2, 3, 4 and 5 present, no. 1 very small. Discoidal cell, median cell and cellula thyridii all present. *Posterior wing* much narrower than the anterior. Costal margin only slightly excised in its apical portion. No discoidal cell. Apical forks nos. 2 and 5 present; apical fork no. 2 rather short. *Intermediate tibiae* and *tarsi* of the ♀ dilated.

Type species.—*Philopotamus tenellus* Rambur, 1842.

Key to Species of *Ecnomus*.

1. Inferior appendages in side-view extending nearly to apex of superiors, apices directed tailward. Spurs 3, 4, 4 . . . . . *E. tillyardi* sp. n. (p. 378).
–. Inferior appendages in side-view reaching only about halfway to apex of superiors, apices turned inward. Spurs 2, 4, 4 . . *E. continentalis* Ulmer (p. 380).

Ecnomus tillyardi sp. n. (fig. 260).

Insect collected in fluid, completely denuded, pale yellowish and probably patterned as is usual in the genus. In both *wings* there is a cross-vein between the sub-costa and radius. *Spurs* 3, 4, 4.

Genitalia, ♂.—Dorsal margin of the ninth segment slightly convex; from the side, upper part rather shorter than the lower and divided from it by a deep, narrow excision. Superior appendages very long and narrow, rectangular, armed at the apices on the inner surfaces with stiff bristles. Upper penis-cover, from above, formed by a pair of short processes armed at their apices with a few hairs. Penis-sheaths short, curving downward. Penis, from above, wide at the base, tapering rather abruptly to a needle-like

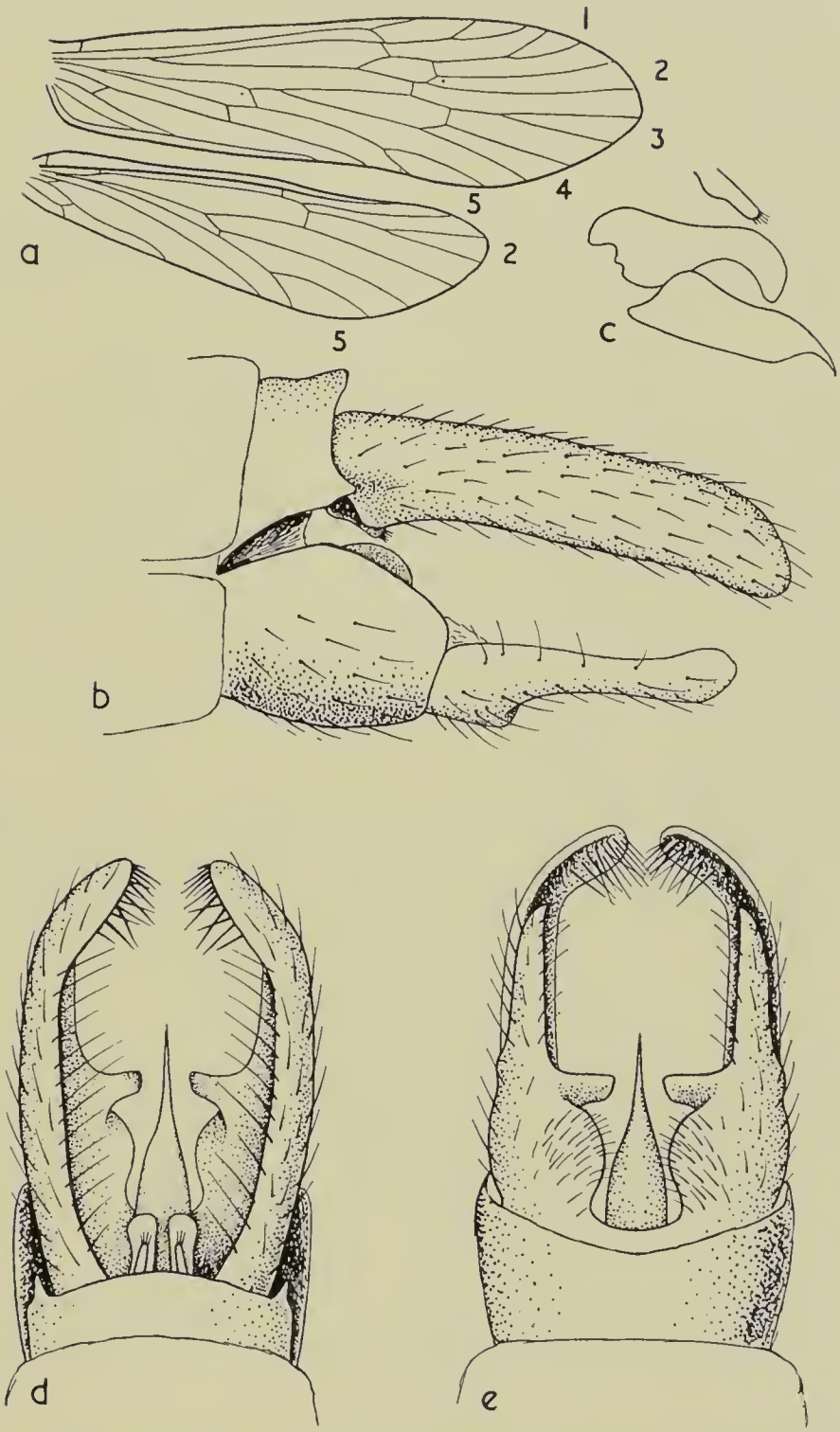

FIG. 260.—*Ecnomus tillyardi* sp. n. ♂. *a*, wings; *b*, genitalia, lateral; *c*, upper penis-cover, penis and sheaths, lateral; *d*, genitalia, dorsal; *e*, ventral.

apex. Inferior appendages nearly as long as the superior, broad at the base, apices dilated as seen from the side, acute from beneath. A short, blunt branch arises from the lower margin, which is somewhat inturned at that point.

Length of the anterior wing, ♂, 6 mm.

Tasmania: 1 ♂ (*type*), J. W. Evans; Cradle Mt., 22.i.1917, 1 ♂, R. J. Tillyard.

Type mounted as a microscope preparation. This species is distinguished from *E. continentalis* Ulmer by its longer inferior appendages, whose apices are directed tailward in ventral view, and by the spur-formula (3, 4, 4).

Ecnomus continentalis Ulmer (fig. 261).

Ecnomus continentalis Ulmer, 1916, *Ark. f. Zool.*, **10**: 10–11, figs. 12–14.

Insect collected in fluid. *Wings* either naturally white or else considerably bleached. *Spurs* 2, 4, 4.

Genitalia, ♂.—Superior appendages very long, barely dilated at their apices, which have clusters of long hairs or spines on their inner surfaces. Upper penis-cover consists of a pair of short, strongly chitinized, downcurved hooks, beneath which is the penis; this is broad, with a complex apex, of which the upper surface is elevated in a hump, and the lower produced, with an obliquely truncate apex whose upper angle strongly projects in an acute spur; from above it is seen as a needle-like point. Inferior appendages short, terminating in bifurcate apices.

Length of the anterior wing, ♂, 6 mm.

The example of the species from which Ulmer drew up his description was taken in Queensland at Malanda. In the Tillyard Collection, now in the British Museum (N.H.) is an example from South Australia, Mt. Gambier, 9.ii.1934, R. J. T., from which I have made the above description.

Ecnomina gen. nov. (Kimmins).

Spurs 3, 4, 4. *Maxillary palpi* with the first joint short; second about half as long again as the first; third and fourth each about twice as long as the first; fifth joint about as long as the first four joints together. In *anterior wing* R_1 is forked at its apex. Apical forks nos. 2, 3, 4 and 5 present. In *posterior wing* Sc and R are fused near apex; discoidal cell present. Apical forks nos. 2, 3 and 5 present. ♂ genitalia differing considerably in pattern in the three species. In all three the ninth segment is divided by a deep lateral excision into tergite and sternite. The ninth tergite is variously produced, possibly representing fused tergite and superior appendages. Inferior appendages more or less fused to each other, in *irrorata* forming a single scoop-like plate. The abdomen of the female terminates in a long ovipositor.

Type species.—*Ecnomina spinosa* sp. n.

This genus is placed in the *Ecnominae* on the evidence of the tibial spurs (3, 4, 4) and the forked R_1 in the anterior wing. It differs from all other

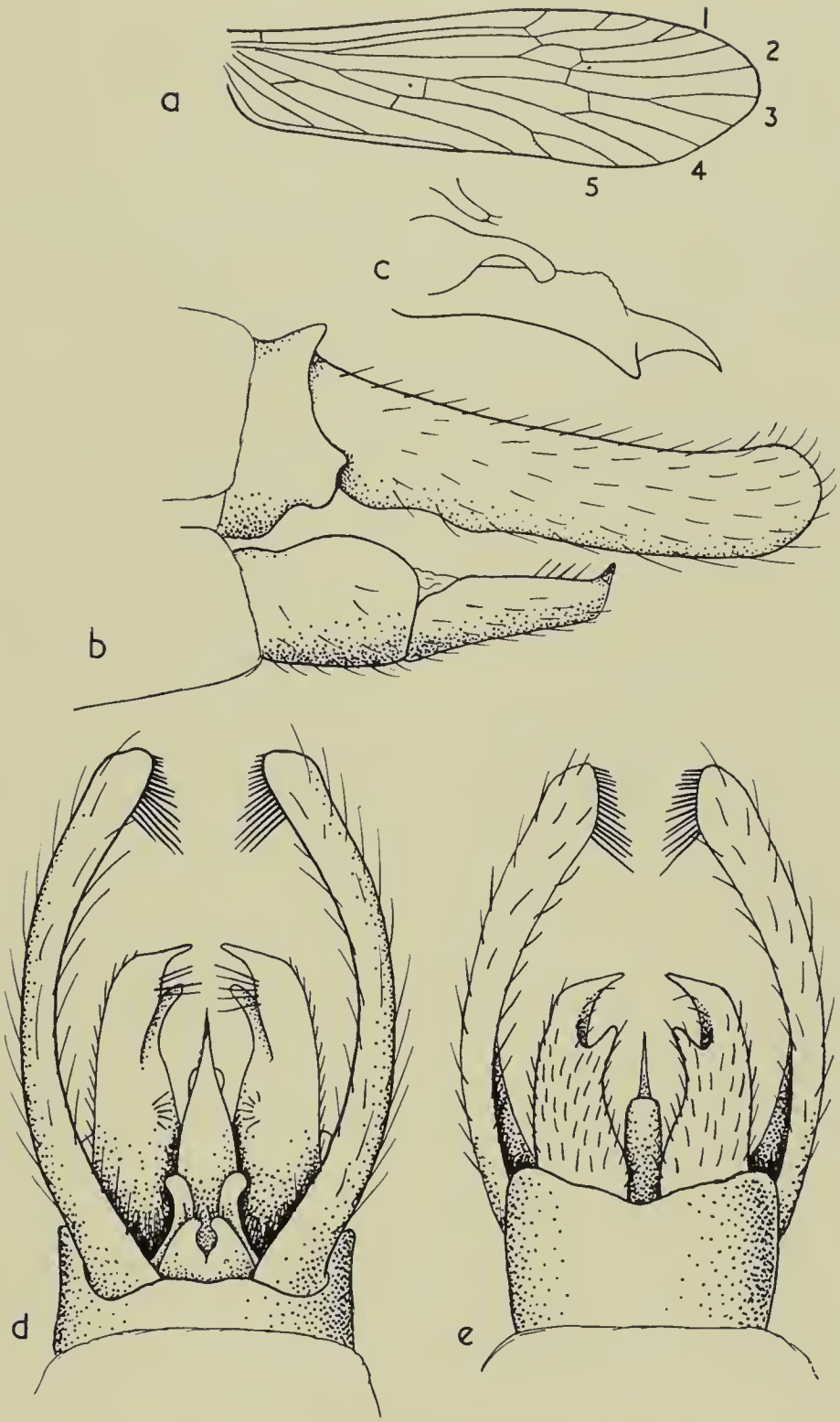

FIG. 261.—*Ecnomus continentalis* Ulmer. ♂. *a*, anterior wing; *b*, genitalia, lateral, penis, etc., omitted; *c*, upper penis-cover, penis and sheaths, lateral; *d*, genitalia, dorsal; *e*, ventral.

described genera in the subfamily in the absence of fork no. 1 in the anterior wing, and in the presence of a closed discoidal cell and apical fork no. 3 in the posterior wing.

Key to Species of *Ecnomina*.

1. Anterior wings brownish with pale irrorations . . *E. irrorata* sp. n. (p. 385).
–. Anterior wings unicolorous . . . . . 2.
2. Ninth tergite of ♂ produced in a pair of calliper-like processes; intermediate appendages spinose . . . . . *E. spinosa* sp. n. (p. 382).
–. Ninth tergite of ♂ produced in three pairs of elongate processes; no intermediate appendages . . . . . *E. trifurcata* sp. n. (p. 382).

Ecnomina spinosa sp. n. (Kimmins) (fig. 262).

♂. *Head* fulvous, with ochraceous hairs. *Antennae* stout, ochraceous, finely annulated with fuscous. *Thorax* fulvous with sparse ochraceous hairs. *Legs* ochraceous. *Abdomen* blackish (? discoloured), appendages ochraceous. *Wings* fuscous, with sparse golden pubescence. Fork no. 3 in *anterior wing* with a very short footstalk, in *posterior wing* about as long as its footstalk.

Genitalia.—Ninth tergite from above forming two flattened plates separated by a narrow excision, their outer angles produced in calliper-like hooks. From the side the tergite is elongate: upper margin strongly and lower slightly sinuate, apex truncate. Upper penis-cover attached to the under surface of the ninth tergite. It takes the form of a pair of curved spines, apices crossing, arising from heavily fringed plates. Penis cylindrical, keeled above at its base, somewhat dilated before the acute apex in side-view. Between the tergite and sternite lies a pair of slender, slightly curved appendages, their lower outer margins armed with six long, strong spines. Ninth sternite produced nearly as far as the apex of the tergite, obliquely truncate from the side, rounded from beneath. Inferior appendages single-jointed, short and stout, fused at their bases. Upper apical angle from the side produced in a slender, incurving finger; lower angle rectangular.

Length of anterior wing, ♂, 5·75 mm.

Australia: New South Wales, Wentworth Park, Wentworth Falls. 23.xi.1916, 1 ♂, R. J. Tillyard.

Type, ♂, mounted as a microscope preparation. This species may be readily distinguished from others in the genus by the form of the ♂ genitalia.

Ecnomina trifurcata sp. n. (Kimmins) (fig. 263).

♂. Fuscous, with brownish pubescence. *Legs* dark fulvous. *Wings* brownish (rather denuded), with traces of reddish brown pubescence.

Genitalia.—From the ninth tergite arise three pairs of long processes, directed tailward. The inner pair are the shortest; their inner margins are serrate and hairy. The second pair are spine-like and sinuous, their apices slightly incurved. The third and outermost pair are the longest, slightly longer than the second pair; from above they are slender, and incurved near the dilated and truncate apices. At their bases these three pairs of processes are linked to the penis by a chitinous rib. Penis slender and sinuous

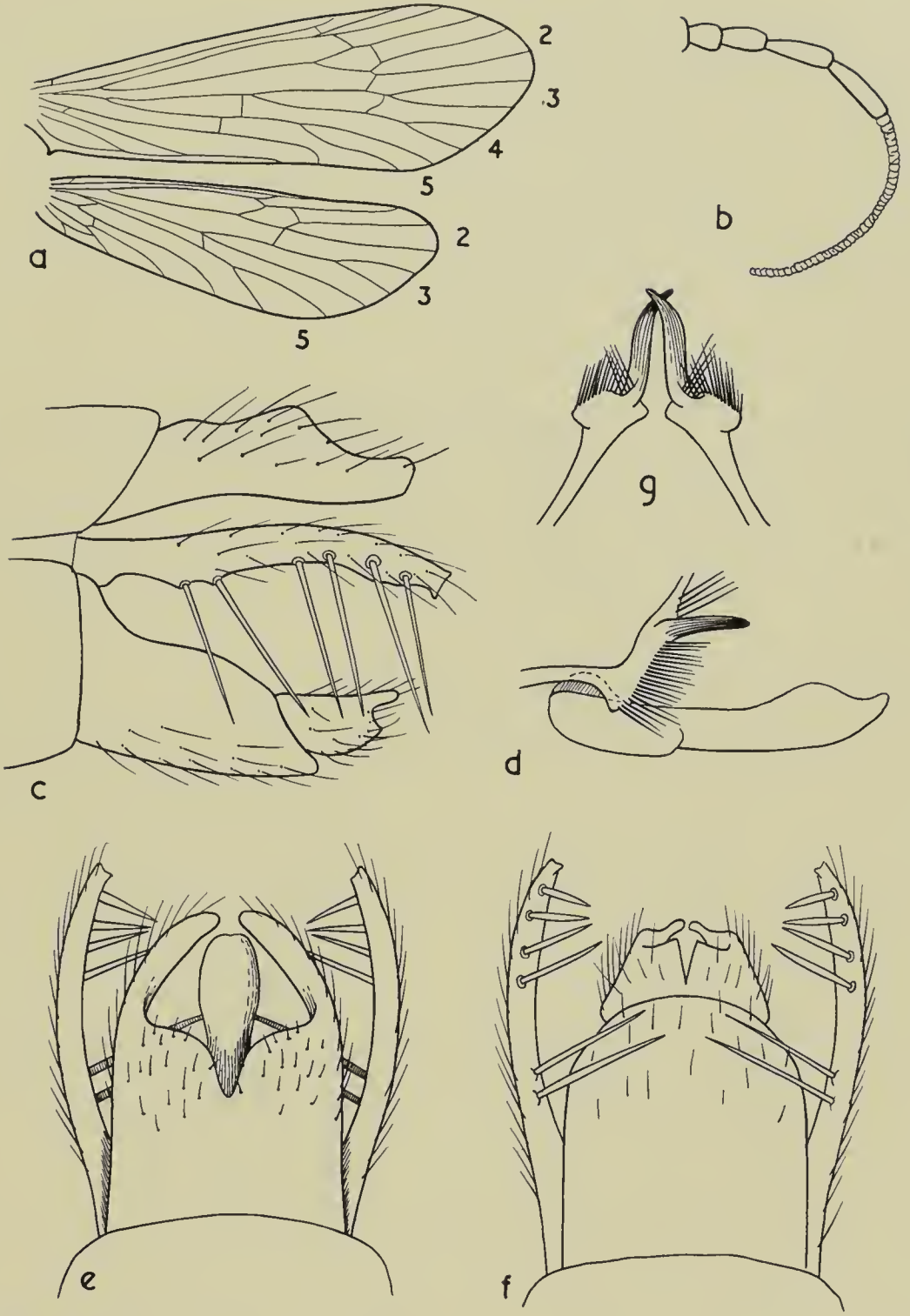

FIG. 262.—*Ecnomina spinosa* gen. sp. n. ♂. *a*, wings; *b*, maxillary palp; *c*, genitalia, lateral; *d*, upper penis-cover and penis, lateral; *e*, genitalia, dorsal, inferior appendages omitted; *f*, ventral, ninth tergite omitted; *g*, upper penis-cover omitted.

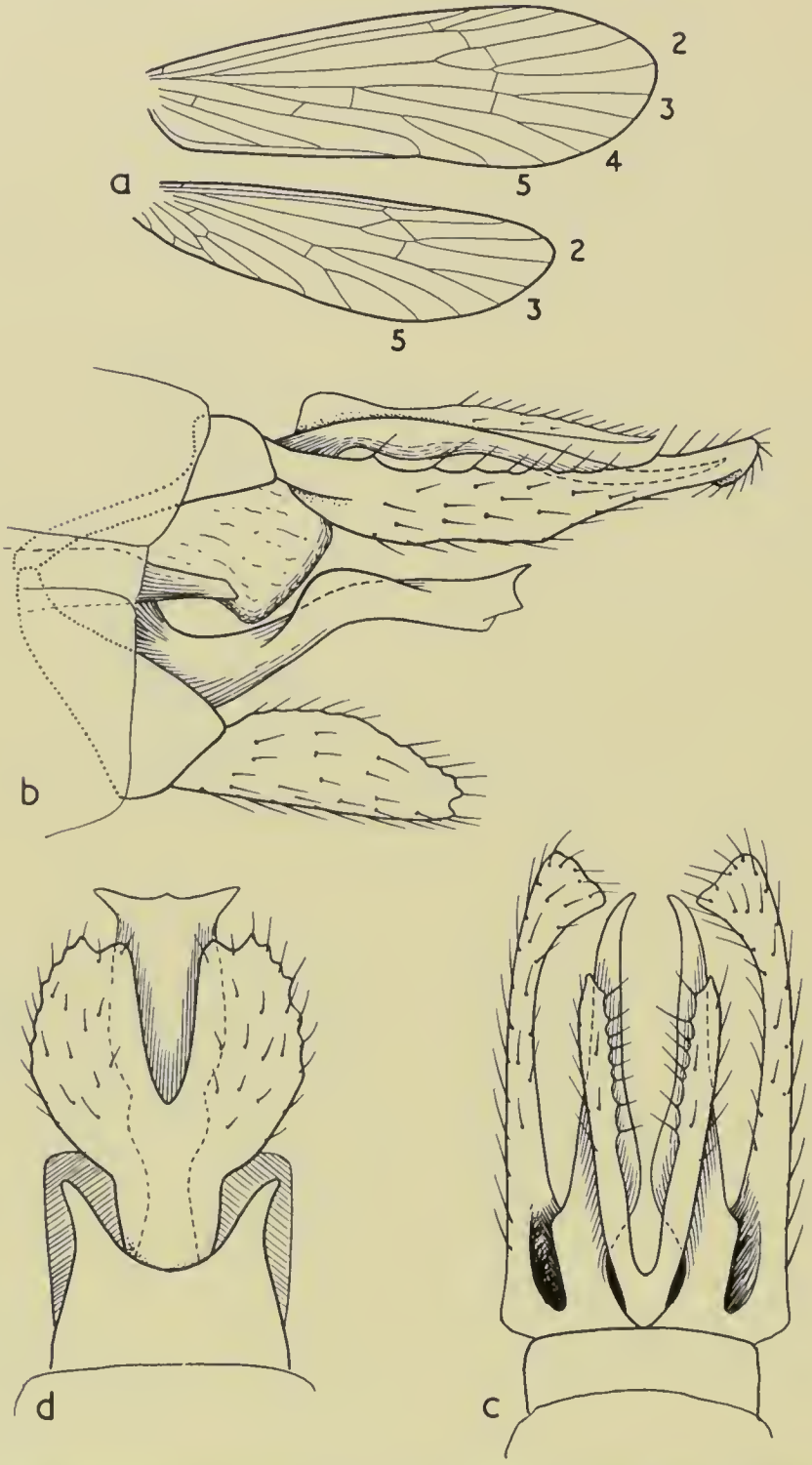

FIG. 263.—*Ecnomina trifurcata* sp. n. ♂. *a*, wings; *b*, genitalia, lateral; *c*, dorsal, inferior appendages omitted; *d*, inferior appendages and penis, ventral.

from the side, flanged about midway and with the upper apical angles acutely produced outwards. On each side of the penis at the base is a short, obliquely truncate sheath. Ninth sternite from beneath deeply and widely excised. Within the excision arise the leaf-like inferior appendages, fused at their bases, outer margins convex and serrate.

Length of anterior wing, ♂, 3·5 mm.

AUSTRALIA : New South Wales, Wentworth Park, 24.xi.1916, 1 ♂, R. J. Tillyard.

Type, ♂, with one pair of wings and the abdomen mounted on a microscope slide. This species may be readily distinguished from others in the genus by the form of the ♂ genitalia and its smaller size.

Ecnomina irrorata sp. n. (Kimmins) (fig. 264).

Head fulvous, with golden hairs. *Antennae* stout, ochraceous, *maxillary palpi* fulvous. *Thorax* fulvous, *legs* ochraceous. *Abdomen* dark reddish fuscous, anal appendages ochraceous. *Wings* with very pale fuscous membrane, anterior clothed with orange-brown and whitish hairs, the latter forming small irrorations. Fork no. 3 in anterior wing a little longer than its footstalk, in posterior wing shorter than its footstalk.

Genitalia, ♂.—Ninth tergite short, weak, forming a pair of small rounded lobes fringed with bristles. From below these lobes the lateral margins are produced in a pair of processes, which are long and moderately broad from the side, lower margin convex, apex rounded, inner surface concave and set with short bristles on finger-like bases. Upper penis-cover short, forming two small, truncate, fringed lobes, within the produced part of the ninth tergite. Penis unusually long, reaching back to the sixth segment, slender, with a narrow apical excision in dorsal aspect. There appears to be a central duct, and there may be a pair of short, spiniform sheaths, but they are rather obscure. Beneath the penis is a single, sword-shaped, down-curved lower penis-cover. Inferior appendages apparently fused to form a single scooped plate, elongate, and excised at its apex.

Length of anterior wing, ♂, 4·75 mm.

TASMANIA : Deloraine, 26–27.xii.1884, 2 ♂, 1 ♀, McLachlan Collection.

Type ♂ mounted as a microscope preparation, 1 ♂ paratype (lacking abdomen), 1 ♀ paratype pinned. This species may be recognized by the irrorate anterior wings and the form of the ♂ genitalia.

15. Fam. **PHILOPOTAMIDAE** Wallengren.

Wallengren, 1891, *K. Sv. Vet. Akad. Handl.*, **24** (10) : 143.
Ulmer, 1907, *Gen. Insect.*, **60a** : 195.

Spurs 2, 4, 4 or 1, 4, 4 or 0, 4, 4. *Ocelli* present. *Maxillary palpi* with the first joint always short ; terminal joint fairly long and articulated ; the intermediate joints varying according to genus. Apical forks nos. 1, 2, 3, 4 and 5 or 1, 2, 3 and 5 present in anterior wing ; in posterior wing forks nos. 1,

2, 3 and 5 or 2, 3 and 5 present. Discoidal cell always present in both wings. An additional costal cross-vein and generally an additional oblique basal cross-vein between Sc and R in anterior wing.

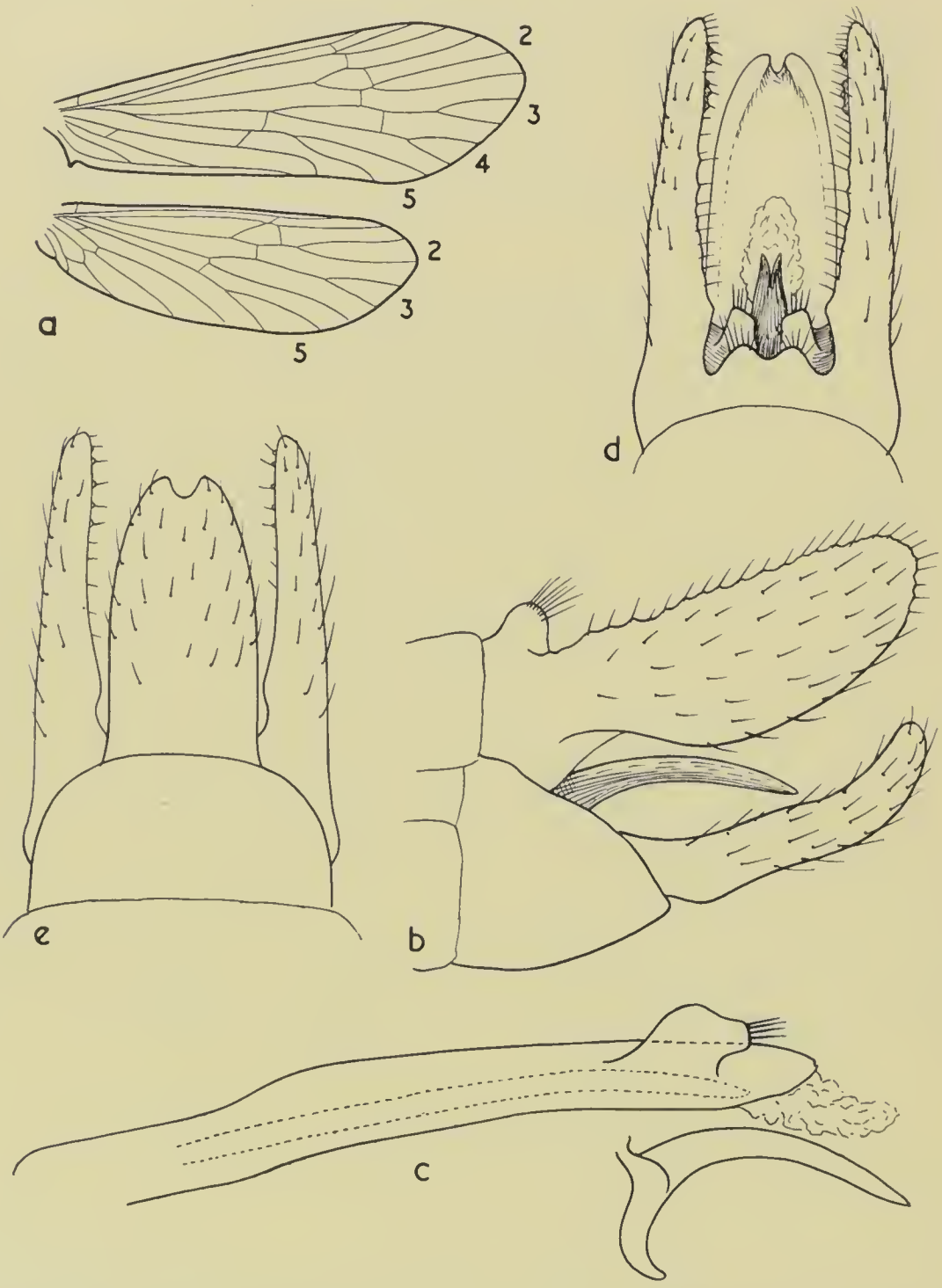

Fig. 264.—*Ecnomina irrorata* sp. n. ♂. *a*, wings ; *b*, genitalia, lateral : *c*, upper penis cover, penis and lower penis-cover, lateral ; *d*, genitalia, dorsal : *e*, ventral.

KEY TO GENERA.

1. In anterior wing apical forks nos. 1, 2, 3, 4, 5 present ; in posterior wing forks nos. 1, 2, 3 and 5 present . . . . . *Hydrobiosella* Tillyard (p. 387).
–. In anterior wing apical forks nos. 1, 2, 3 and 5 ; in posterior wing forks nos. 2, 3 and 5 present . . . . . 2.
2. Spurs 1, 4, 4. Discoidal cell in both wings rather broad ; ♂ inferior appendages single-jointed . . . . . *Chimarra* Stephens (p. 398).
–. Spurs 2, 4, 4, Discoidal cell more elongate ; ♂ inferior appendages two-jointed *Zelobiosella* gen. n. (p. 397).

Hydrobiosella Tillyard.

Hydrobiosella Tillyard, 1924, *Trans. N. Zeal. Inst.*, **55** : 288.

In the *anterior wing* forks nos. 1, 2, 3, 4 and 5 present, 1 and 2 sessile, 3, 4 (generally), and 5 with footstalks. Discoidal cell short, median cell long and narrow. A cross-vein uniting the costa and sub-costa towards the centre of the costal area, another the sub-costa and radius, and the radius is united to the radial sector by a cross-vein meeting it towards the distal end of the discoidal cell. A hyaline streak bordering the cross-vein at the anastomosis, another closing the cellula thyridii and a third at the arculus. Many of these cross-veins are omitted in Tillyard's figure.

In the *posterior wing* forks nos. 1, 2, 3 and 5 and three anal veins are present, and there are cross-veins uniting the sub-costa and radius and the radius with its sector as in the anterior wing. These cross-veins are also omitted in Tillyard's figure, as is the cross-vein uniting the media and cubitus.

In the *maxillary palpus* the basal joint is short, second still shorter and globular in form, third longer than the first and second together, fourth about as long as the first and second together, fifth about as long as the first four together. *Spurs* 2, 4, 4. Inferior appendages two-jointed, the terminal joint unbranched.

Type species.—*Hydrobiosella stenocerca* Tillyard, 1924.

This genus is closely allied to *Dolophilus* McLachlan, *Philopotamus* Stephens and to *Trentonius* Betten and Mosely. It differs from *Dolophilus* in having three anal veins in the posterior wing as against two, and also in the maxillary palpi, in which the terminal joint is much longer than in that genus. In comparison with *Philopotamus*, the neuration of the posterior wing is similar and the terminal joint of the maxillary palpus is only slightly longer but, in this European genus, all the species agree in having the terminal joint of the inferior appendages branched, whereas in *Hydrobiosella* the terminal joint is always simple.

McLachlan has stated of *Philopotamus* that

"although several North American insects have been placed in the genus (agreeing in possessing ocelli, and in the colours, etc.), I am not sure that any of them will be retained in it."

These American species seem all to have the second joint of the inferior appendages unbranched, and they have since been transferred to *Trentonius* Betten and Mosely. This genus differs from *Hydrobiosella* in having fork no. 1 in the anterior wing with a footstalk.

KEY TO SPECIES OF *Hydrobiosella*, MALES.

1. Inferior appendages with the terminal joint definitely shorter than the basal joint . . . . . 2.
–. Inferior appendages with the two joints about equal in length . . . . 5.
2. Lateral margins of ninth tergite not produced in finger-like processes on each side of the upper penis-cover . . . . . 3.
–. Lateral margins of ninth tergite produced in finger-like processes on each side of upper penis-cover . . . . . 4.
3. Upper penis-cover from above triangular, about half as long as inferior appendages . . . . . *H. stenocerca* Tillyard (p. 388).
–. Upper penis-cover from above lanceet-like, nearly as long as inferior appendages *H. michaelseni* (Ulmer) (p. 392).
4. Lateral margin of ninth tergite with a triangular projection above the upcurved finger, as seen from the side. Fork no. 1 in posterior wing sessile *H. tasmanica* sp. n. (p. 390).
–. Lateral margin of ninth tergite without such triangular projection. Fork no. 1 in posterior wing with a footstalk . . . . *H. cognata* sp. n. (p. 392).
5. Terminal joint of inferior appendages from the side as stout as basal joint *H. waddama* sp. n. (p. 393).
–. Terminal joint from side slender and curved . . . . . 6.
6. Terminal joint from side sharply angled, apex rounded *H. bispina* sp. n. (p. 394).
–. Terminal joint arched, apex acute . . . . *H. arcuata* sp. n. (p. 397).

Hydrobiosella stenocerca Tillyard (fig. 265).

Hydrobiosella stenocerca Tillyard, 1924, *Trans. N. Zeal. Inst.*, 55 : 289–290, pl. 19, figs. 1, 2, text-figs. 3, 4.
Philopotamus stenocerca Banks, 1939, *Bull. Mus. Comp. Zool. Harv.*, 85 : 498, fig. 50.

Tillyard describes the species as follows :

"Total length, 4–5·5 mm. ; forewing, 7–9 mm. ; expanse, 15–19 mm."

"*Head.*—Eyes greyish-black. Vertex with a strong tuft of yellowish hairs extending between bases of antennae. Antennae somewhat shorter than forewing, yellowish-brown, strongly annulated with dark brown ; the basal segment with a tuft of dark hairs above it. Maxillary palpi brownish, with the bases of segment 3–4 yellowish-brown. Labial palpi long and very slender, dull-brownish."

"*Thorax* fuscous, marked with brown ; pronotum with stiff, dark hairs, and sometimes also with some yellowish hairs like those on the vertex. Legs testaceous, the tarsi slightly darkened basally."

"*Wings.*—Forewing irregularly mottled with medium fuscous and yellowish-brown, showing several more or less conspicuous blotches of the darker colour, notably one across Cu_1 somewhat before middle of wing, and a larger oblique and somewhat curved one arising about middle of posterior margin and running upwards and outwards over base of cubital fork on to M_{3+4}. Costal and apical margins always more or less spotted with alternate fuscous and yellowish-brown patches, and pterostigma irregularly marked with both these colours. All the markings very variable ; some specimens, usually those of larger size, being very boldly and beautifully marked, while others, usually of smaller size, have the markings more or less obliterated, and appear much less variegated in colour. Hindwing semi-hyaline, pale fuscous, slightly darker distally than basally, somewhat iridescent along main veins, and sometimes with slight mottling like that of forewing around apical margin."

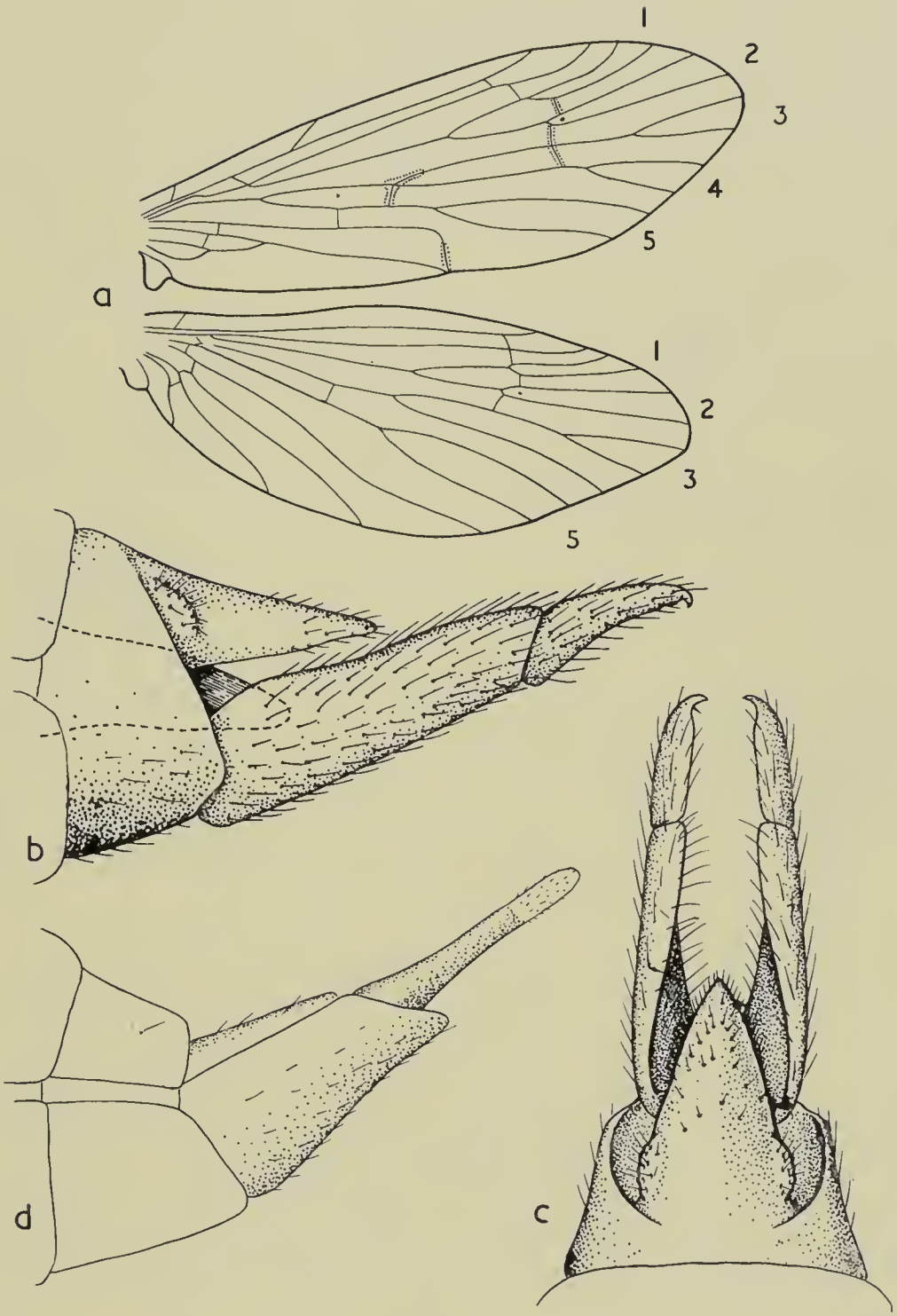

FIG. 265.—*Hydrobiosella stenocerca* Tillyard. *a*, ♂ wings; *b*, ♂ genitalia, lateral; *c*, dorsal; *d*, ♀ apex of abdomen, lateral.

As Tillyard's account of the *genitalia* is rather scanty I give a further description from an example in the British Museum (N.H.):

Apical margin of the ninth dorsal segment truncate, upper penis-cover a large triangular hood with a very acute apex, a low hairy wart on each side at the base. Penis straight, forming a sleeve filled with membrane. Attached to this membrane within the penis can be seen, in a cleared example, two curved rows of spines or bristles, set close together and opposing each other, and still further basally are two small groups of spines. Inferior appendages two-jointed, very long and slender. Terminal joint about half as long as the

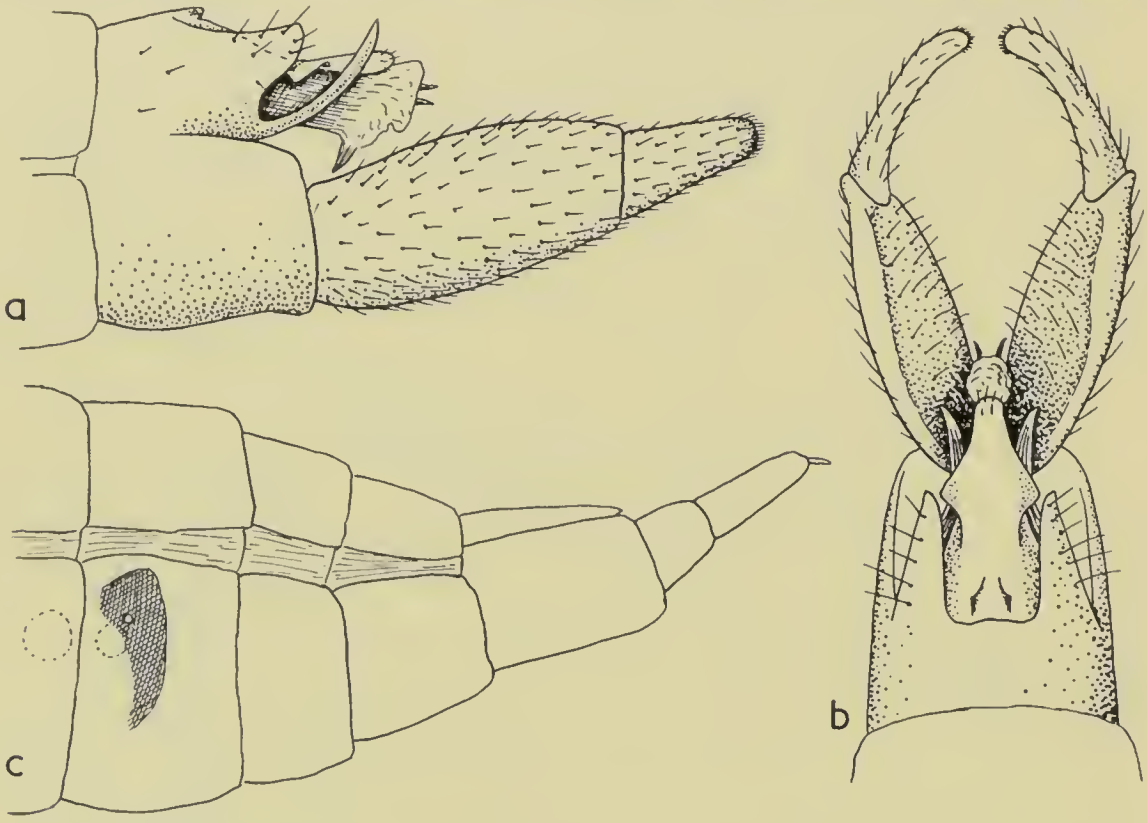

Fig. 266.—*Hydrobiosella tasmanica* sp. n. *a*, ♂ genitalia, lateral; *b*, dorsal; *c*, ♀ apex of abdomen, lateral.

basal and set obliquely on its apex, terminating in a small down-turned claw.

Genitalia, ♀.—The abdomen terminates in a long slender ovipositor.

New Zealand: Nelson, Wellington, Canterbury, etc.

Holotype, ♂, from Gouland Downs, 7.ii.1922, R. J. Tillyard; allotype, ♀. Nelson, 29.xii.1920, A. Philpott, both in the Cawthron Institute. Numerous examples in the British Museum (N.H.), with dates ranging from October to April.

Hydrobiosella tasmanica sp. n. (fig. 266).

Wings with coloration and neuration as in *Hydrobiosella stenocerca* Tillyard.

Genitalia, ♂.—Ninth segment smaller above than below, the upper part

divided from the lower by a deep and narrow excision. From above, the margin is widely excised, exposing the upper penis-cover. From the side, the upper part terminates in a triangular projection with the lower distal angle produced in a long, fairly stout, upcurving finger which, from above, terminates in a narrow, obliquely truncate apex. The upper penis-cover has a pair of minute, out-turned shelves at the base of its dorsal surface ; it is large, with two blunt, angular, lateral projections towards the centre. Penis rather broad from the side, with two strong, downwardly directed teeth arising from its under surface towards the apex, which is membranous above

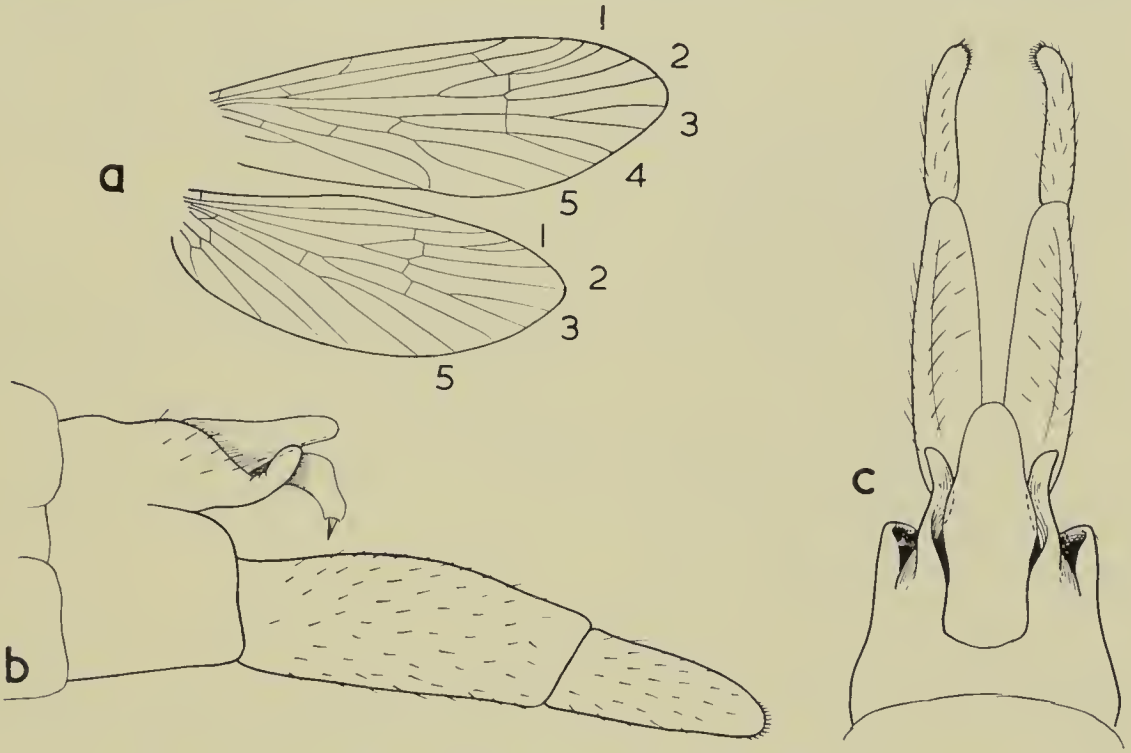

Fig. 267.—*Hydrobiosella cognata* sp. n. ♂. *a*, wings ; *b*, genitalia, lateral ; *c*, dorsal.

and carries a pair of peg-like teeth. Inferior appendages two-jointed, long, rather slender ; basal joint about twice the length of the terminal.

Genitalia, ♀.—The abdomen terminates in a long, tapering ovipositor. There is a valvular structure with reticulated surface on the fifth sternite.

Length of the anterior wing, ♂, 7·5 mm., ♀, 8·3 mm.

Tasmania : Hobart, xii.1937, 2 ♂, 1 ♀, Mt. Wellington, 3700 ft., 7.ii.1942, 1 ♀, J. W. Evans ; Waratah, 1 ♀, Lea ; Cradle Mt., 16.i.1917, 1 ♂, R. J. Tillyard ; no other data, J. W. Evans, numerous examples in fluid.

Type, ♂, labelled "Tasmania, J. W. Evans," mounted as a microscope preparation.

This species differs from the type species in the finger-like processes of the ninth tergite on each side of the upper penis-cover.

Hydrobiosella cognata sp. n. (Kimmins) (fig. 267).

♂. *Head* fuscous, warts fulvous, hairs golden. *Antennae* and *palpi* brownish ochraceous. *Thorax* fuscous, with golden hairs. *Legs* ochraceous. *Wings* pale fulvous, anterior with yellowish irrorations, the irrorate pattern of the membrane duplicated by brownish and yellowish pubescence, posterior with mainly yellowish pubescence; tips of the apical veins brownish. In the *anterior wing* fork no. 3 is longer than its footstalk, 4 practically sessile. In the *posterior wing* fork no. 1 has a definite footstalk, and 3 is a little longer than its footstalk.

Genitalia.—Similar in pattern to *H. tasmanica* but differing in detail as follows: Upper part of the ninth tergite rounded, not triangularly produced, the upturned finger shorter, stouter and more out-turned. Upper penis-cover with the lateral projections of *tasmanica* much less evident. Penis without the peg-like teeth arising from the membrane. Inferior appendage with the basal joint rather narrower from the side.

Length of anterior wing, 9·5 mm.

Tasmania: Lake St. Clair, ii.1941, 1 ♂, J. W. Evans.

Type, ♂, with one pair of wings and the abdomen mounted as a microscope preparation in the British Museum (N.H.). The differences between this species and *H. tasmanica* have been dealt with in the above description.

Hydrobiosella michaelseni (Ulmer) (fig. 268).

Dolophilus michaelseni Ulmer, 1908, in Michaelsen und Hartmeyer, *Fauna Südwest Australiens*, 2 : 36–37, figs. 16, 17.
Dolophilus michaelseni Tillyard, 1926, *Ins. Austr. N.Z.* : 391.

The following is a free translation of Ulmer's description:

Head, *pronotum* and *mesonotum* blackish brown, the warts of the head yellowish brown. *Abdomen* brown. *Antennae* yellowish brown, annulated broadly from the third to about the fifteenth joints with black. *Maxillary palpi* and *forelegs* brown, *median* and *hindlegs* lighter, especially on their inner surfaces. *Spurs* 2, 4, 4, inner spurs longer than the outer. *Fore wing* brown, shining and transparent, with short, yellowish hair, black at the base of the costa, veins dark brown. Cross-veins at the anastomosis, arculus and median cell hyaline. Fork no. 4 sessile. *Hind wing* lighter than the fore wing, iridescent, with close, dark brown pubescence. Fringes of both wings dark brown. Superior appendages wanting. Dorsal plate long, reaching to the apices of the inferior appendages, lancet-shaped as in *Dolophilus pullus*, with a very strong central keel expanded at the apex. Beneath the dorsal plate is a pair of semicircular spines, apices directed upward, from the side. Inferior appendages from the side, resembling the *Rhyacophila* pattern. Second joint with the apical margin concave, dorsal margin much shorter than the ventral; distal surface much more broadened than in other species of *Dolophilus*, and set with a dense mat of black setae. Ninth tergite widely excised.

Length of body, 6 mm.; expanse, 17–18 mm.

S. W. Australia: Brunswick, 7.x.05.

Type in the Hamburg Museum, paratype, ♂, in Dr. Ulmer's Collection.

[When copying the illustrations for this species I was struck by the very close resemblance to Mosely's new species, *H. waddama*, and wrote to Dr. Ulmer, asking him to examine any material that he might have. He replied that he had a ♂ paratype, and that on the characters given by Mosely for separating *Hydrobiosella* from *Dolophilus*, his *D. michaelseni* was in fact a *Hydrobiosella*. I am therefore transferring it to that genus, and the genus *Dolophilus* should be removed from the list of Australian Trichoptera.

There are I think sufficient differences between *michaelseni* and *waddama* to warrant their separation. The proportions of the joints of the inferior appendages are different, and fork no. 4 in the anterior wing is sessile in *michaelseni*.—D. E. K.]

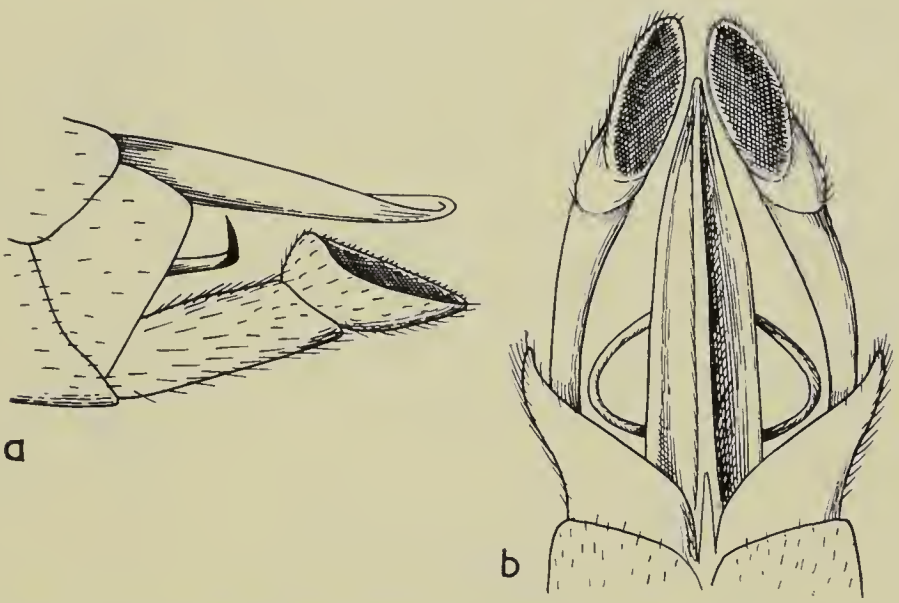

Fig. 268.—*Hydrobiosella michaelseni* (Ulmer). ♂ genitalia after Ulmer. *a*, lateral; *b*, dorsal.

Hydrobiosella waddama sp. n. (fig. 269).

Insect brownish. *Wings* with the irrorations usual in this genus.

Genitalia, ♂.—Ninth segment membranous above. There is a large upper penis-cover tapering from about midway to a subacute apex, with the lateral margins extended in narrow plates. Penis-sheaths (or perhaps lower penis-cover) in the form of a pair of long spines arising from the ventral surface at the base, arching up, one on each side of the penis and terminating under the apex of the upper penis-cover. Penis membranous. Inferior appendages two-jointed, joints stout, about equal in length, the inner surface of the terminal joint at the apex bearing a dense mat of short black setae or spines. From the side, the strongly chitinized part of the ninth segment extends up barely beyond the eighth pleurite.

Length of the anterior wing, ♂, 6·5 mm.

Tasmania : Waddamana, R. Ouse, 2 ♂, 1 ♀, Critchley Parker.

Australia : N. S. Wales, Rules Point, 4450 ft., 39.xii.1934, 5 ♂, R. J. Tillyard.

Type, ♂ (Waddamana), as a mieroseope preparation.

This species differs from the type speeies in the proportions of the joints of the inferior appendages and in the long spines below the penis. It is elosely related to *H. michaelseni* (Ulmer), from whieh it differs in the relative lengths of the joints of the inferior appendages and in having fork no. 4 in the anterior wing stalked.

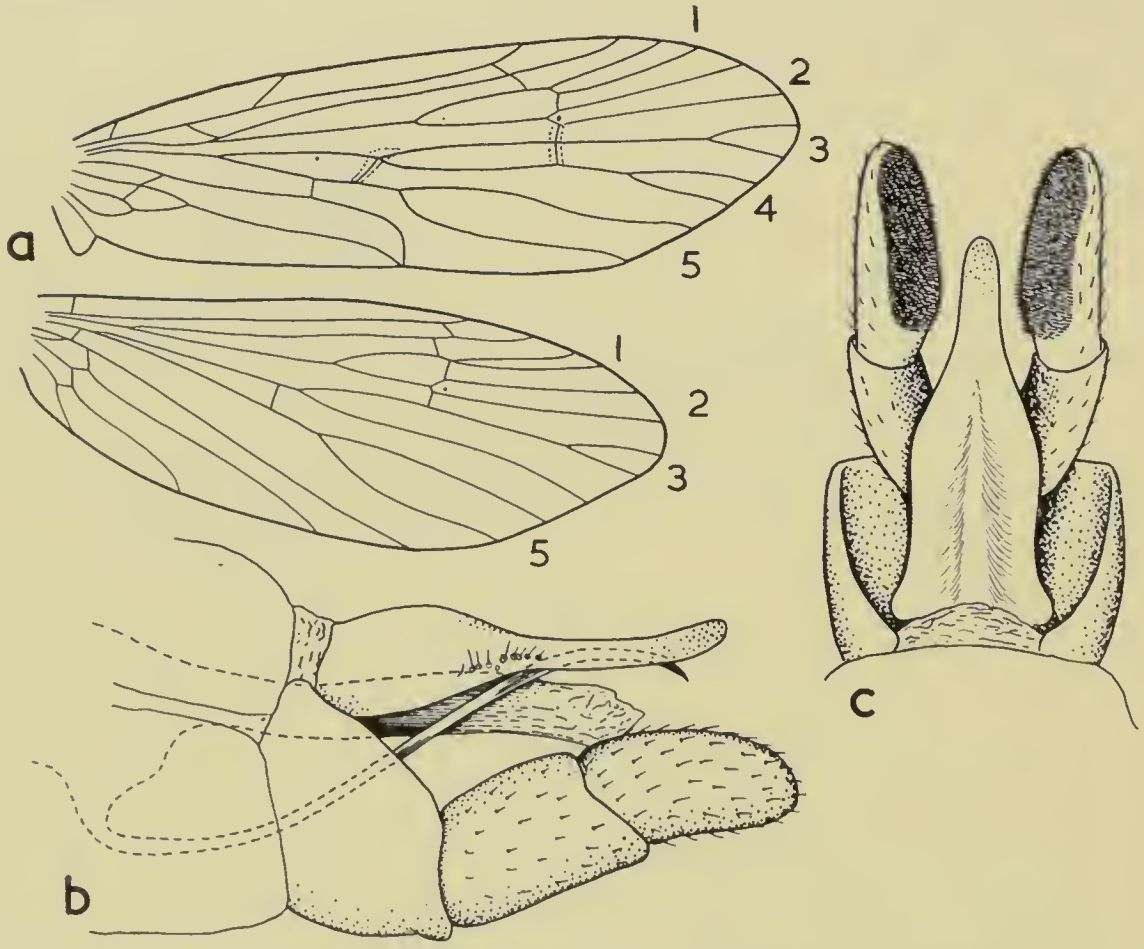

Fig. 269.—*Hydrobiosella waddama* sp. n. ♂. *a*, wings ; *b*, genitalia, lateral ; *c*, dorsal.

Hydrobiosella bispina sp. n. (Kimmins) (fig. 270).

♂. *Head* tawny, with yellow and dark brown hairs, *antenna* with the base of each joint fuseous, shading to oehraeeous at apex of joint, the proportion of fuseous to oehraeeous inereasing towards the apex of antennae. *Palpi* tawny. *Thorax* and *abdomen* fulvous, anal appendages yellowish. *Legs* oehraeeous. *Anterior wing* clothed with short, dense pubescence, dark reddish brown with numerous small yellow spots. *Posterior* with less dense

fulvous pubescence. In *anterior wing* fork nos. 1 and 2 sessile, fork no. 3 about half as long again as its footstalk, fork no. 4 with a short footstalk. In *posterior wing* forks no. 1 and 2 sessile, fork no. 3 rather longer than its footstalk. Apices of both wings rather more pointed than in *H. cognata*.

Genitalia.—Ninth segment from the side with a deep narrow excision almost to the basal margin ; upper part somewhat shorter than the lower. From above, the upper part is quadrate, with a raised central part, separated from the lateral margins by deep grooves. This raised part is prolonged to form a trifid upper penis-cover. The central lobe is the longer, transparent

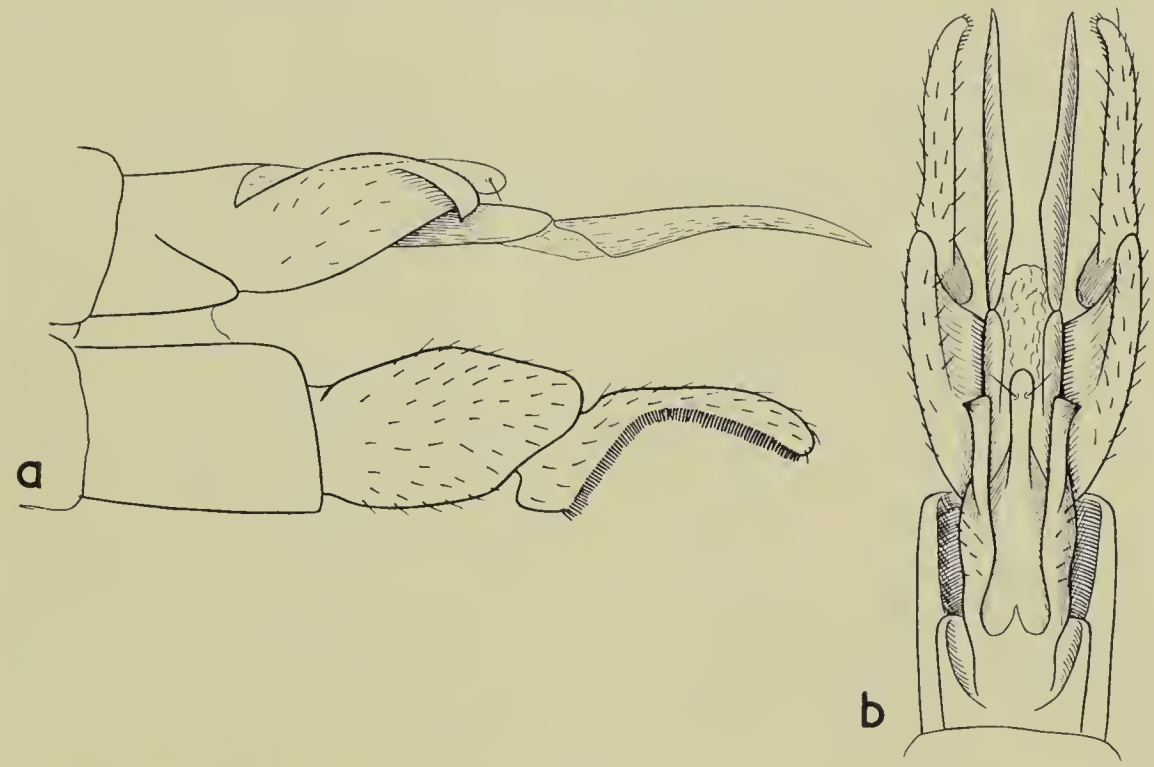

Fig. 270.—*Hydrobiosella bispina* sp. n. ♂ genitalia. *a*, lateral ; *b*, dorsal.

and finger-like, carrying two short bristles. The lateral lobes are more pigmented, forming deep plates, set on edge, whose lower apical angles are directed outward and acute. Penis slender, cylindrical ; within it, towards the base, can be seen (in a cleared example) some minute chitinous teeth attached to a crumpled membrane. Jointed to the apex of the penis are a pair of long curved spines. Inferior appendages two-jointed : basal joint large, rhomboidal ; terminal joint slender, sharply angled about midway, its apex rounded, the entire lower margin fringed with short, stout, black teeth. Ventral margin of the ninth segment without processes.

Length of anterior wing, 8 mm.

Australia : New South Wales, Stanwell Park, 23.iv.1916, 2 ♂, R. J. Tillyard ; Bathurst, 2300 ft., 8.xi.1884, 1 ♂, McLachlan Collection.

An example (without abdomen) from Hornsby, 14.ix.1917, may possibly belong to this species.

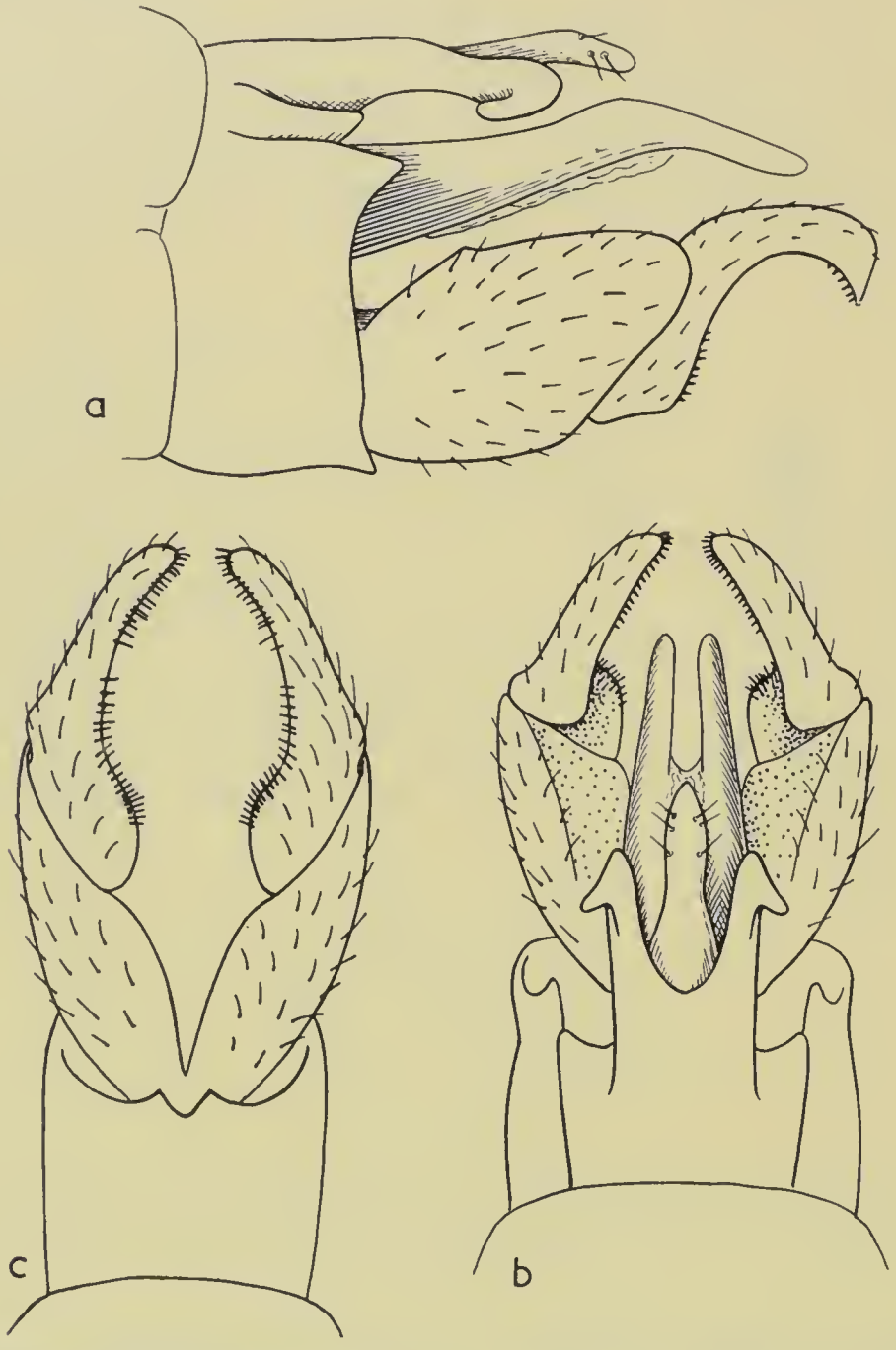

Fig. 271.—*Hydrobiosella arcuata* sp. n. ♂ genitalia. *a*, lateral; *b*, dorsal; *c*, inferior appendages, ventral.

Type, ♂ (Stanwell Park), mounted as a microscope preparation.

This species differs from *H. waddama* in the form of the ♂ genitalia, particularly in the inferior appendages.

Hydrobiosella arcuata sp. n. (Kimmins) (fig. 271).

In general appearance closely resembling *H. bispina*. Neuration of *anterior wing* similar. In *posterior wing* only fork no. 2 sessile, fork no. 1 with a short footstalk, no. 3 shorter than its footstalk.

Genitalia, ♂.—In general pattern conforming to that of *H. bispina*, but a little shorter and stouter, and differing in detail as follows: Upper penis-cover from the side with the apices stouter and more hooked, from above with the apices directed more basally; central lobe more acute apically. Penis with the apical spines shorter, less acute and apparently fused to the stem. Internal teeth stronger and more numerous. Lower part of ninth segment from the side with the upper apical angles acutely produced (not obtuse). Centre of the apical margin with a pair of small triangular projections. Inferior appendages with the basal joint rather more definitely rhomboidal. Terminal joint arched rather than angled, its apex produced downward in an acute point; the clothing of black teeth less dense and set more on the inner surface of the appendage.

Length of anterior wing, 8 mm.

AUSTRALIA: Queensland, Montville, 3.x.1912, 1 ♂, R. J. Tillyard.

Type, ♂, with the abdomen mounted as a microscope preparation. This species is clearly related to *H. bispina* both in general appearance and in genital structure, but the differences in neuration and genitalia, coupled with the separation of the localities, seem to warrant its recognition as a distinct species. These differences are set out in the foregoing description.

Zelobiosella gen. n.

Zelobiosella differs from *Hydrobiosella* Tillyard mainly in neuration. Forks nos. 4 in the anterior wing and no. 1 in the posterior wing are absent in this new genus but present in *Hydrobiosella*. The ♂ genitalia differs slightly from the type pattern, but not sufficiently to constitute a generic difference. In other characters the two genera are alike.

Type species.—*Zelobiosella tonela* sp. n.

Zelobiosella tonela sp. n. (fig. 272).

Head fuscous. *Antennae* dark ochraceous without annulations. *Anterior wing* dark fuscous, with numerous yellow irrorations.

Genitalia, ♂.—Centre of the margin of the ninth dorsal segment produced in a long plate with an acute apex; lateral margins set with short, widely-spaced hairs. Side-pieces of the segment appear on each side of it as slender, finger-like projections. Penis membranous, bearing at its apex numerous minute bristles. Inferior appendages very long, two-jointed, the second joint about half as long as the first, its apex produced in a small, inturned claw as seen from above, excised from the side.

Length of anterior wing, ♂, 5 mm.

NEW ZEALAND: Wilton's Bush, x–xi.1934, 1 ♂, 1 lacking abdomen, G. V. Hudson.

Chimarra Stephens.

Chimarra Leach, 1815, *Edinb. Encyc.*, 9 : 136 (*nomen nudum*).
Chimarra Stephens, 1829, *Syst. Cat. Brit. Ins.* : 318.
Chimarra Curtis, 1835, *Brit. Ent.*, pl. 61 and text.
Chimarrha Burmeister, 1839, *Handb. Ent.*, 2 : 910 (*nomen emendatum*).
Chimarrha Ulmer, 1907, *Gen. Insect.*, 60a : 199.

Spurs 1, 4, 4. *Antennae* much shorter than the wings, widely separated at the point of insertion. Basal joint short and stout, not so long as the head.

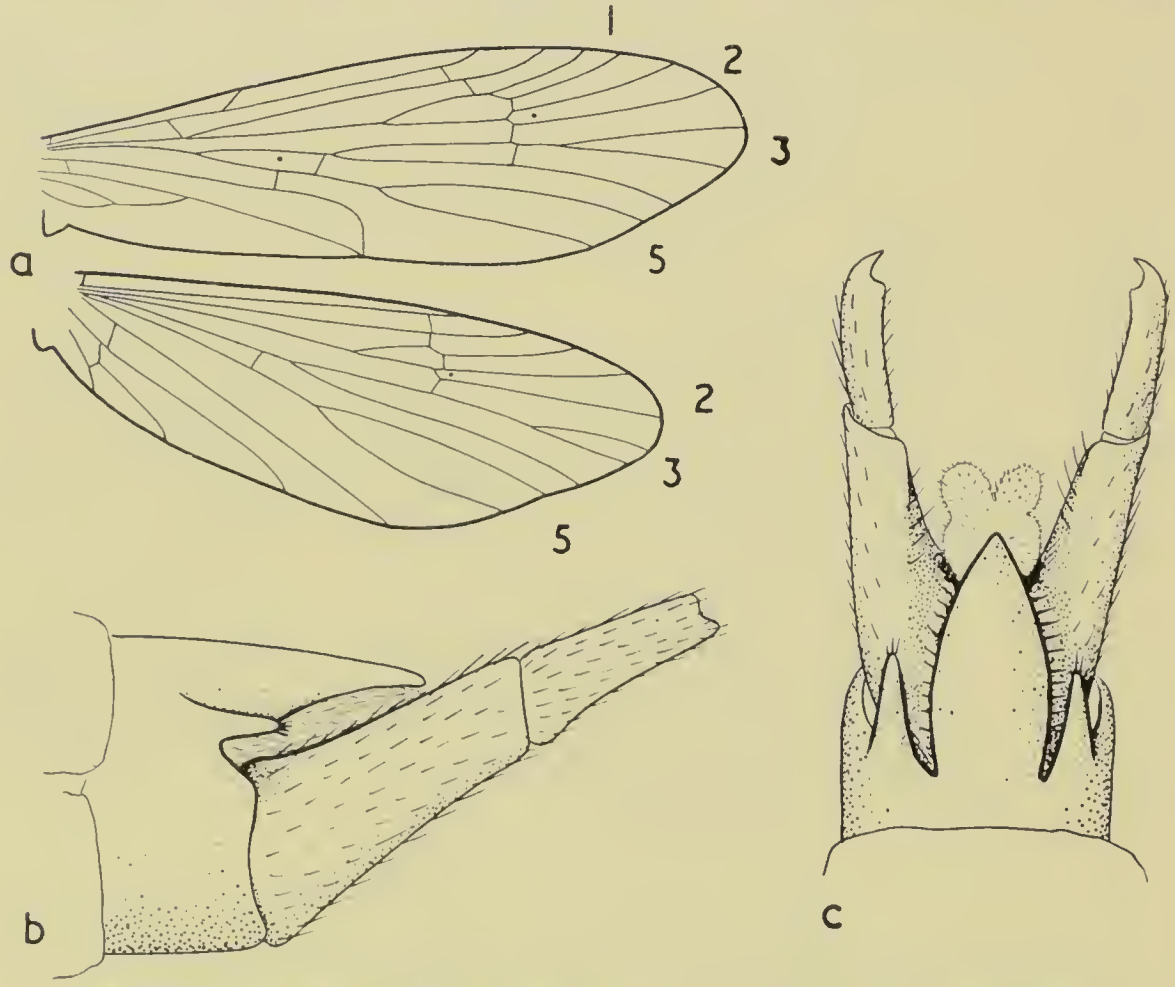

Fig. 272.—*Zelobiosella tonela* gen. sp. n. ♂. *a*, wings ; *b*, genitalia, lateral ; *c*, dorsal.

Maxillary palpi long and thick. First joint very short, second and third very long, the second longer than the third and with a tuft of bristle-like hairs at its apex ; fourth triangular and very short ; fifth longer than the fourth and slightly shorter than the third. *Wings* long and narrow, anterior with the costal and anal margins nearly parallel. Pubescence slight ; generally there is a large, shining, nude space below the sector just before it furcates. Apical forks nos. 1, 2, 3, 4 and 5 present in the *anterior wing*. *Posterior wing* scarcely broader than the anterior. Apical forks nos. 1, 2, 3 and 5 generally present,

although fork no. 1 is lacking in all the Australian species dealt with here. Discoidal cell small and triangular.

Type species.—*Phryganea marginata* Linnaeus, 1767.

[The name *Chimarrha*, under which the genus has been generally known for many years, is an emendation by Burmeister (1839) for *Chimarra* (Leach MSS.) Stephens, 1829. Under the International Rules of Zoological Nomenclature, the original orthography of a name is to be preserved, unless an error of transcription, a *lapsus calami*, or a typographical error is evident. Since neither Leach nor Stephens gave the derivation of the name *Chimarra*, there seem to be no real grounds for accepting Burmeister's emendation.—D. E. K.]

Key to Species of *Chimarra*, Males.

1. Head dark reddish ochraceous, with reddish hairs on frons *C. uranka* sp. n. (p. 399).
–. Head black, with black hairs . . . . . 2.
2. Lower apical angle of upper penis-cover forming an upturned hook on each side of penis . . . . . *C. australica* (Ulmer) (p. 399).
–. Lower apical angle of upper penis-cover triangular, not hooked *C. monticola* sp. n. (p. 402).

C. australis (Navás) is omitted from this key owing to its inadequate description.

Chimarra uranka sp. n. (fig. 273).

Head dark reddish ochraceous between the oculi, which are black. The frons is covered with reddish hairs. *Wings* and *legs* black.

Genitalia, ♂.—Centre of the apical margin of the ninth dorsal segment produced in two black, finger-like and parallel processes, on each side of which is a rounded wart, probably representing a superior appendage. Beneath the processes there arise a long upper penis-cover directed tailward and upward, apex rounded from above, down-hooked from the side. At the base of it, from the side, scarcely projects the blunt apex of the penis. On each side of the penis and its cover is a pair of stongly chitinized plates, which appear to be connected with the lower surface of the apex of the ninth dorsal segment. Inferior appendages broad, margins strongly serrate, apices produced and acute, directed inward. There is a small, serrate ridge on the inner surface of each, towards the apical margin, with a small black tooth projecting inwards and visible from beneath as a small spur. A strong process to the eighth ventral segment and a much smaller one to the ninth.

Length of the anterior wing, ♂, 5 mm.

Australia: N. Queensland, Kuranda, 1100 ft., 21.vi–24.vii.1913, 1 ♂, R. E. Turner.

This species may be separated from those following by the colour of the head and by the ♂ genitalia.

Chimarra australica (Ulmer) (fig. 274).

Chimarrha australica Ulmer, 1916, *Ark. f. Zool.*, **10** : 3–5, figs. 3–6.
Chimarrha australica Tillyard, 1926, *Ins. Austr. N.Z.* : 391.

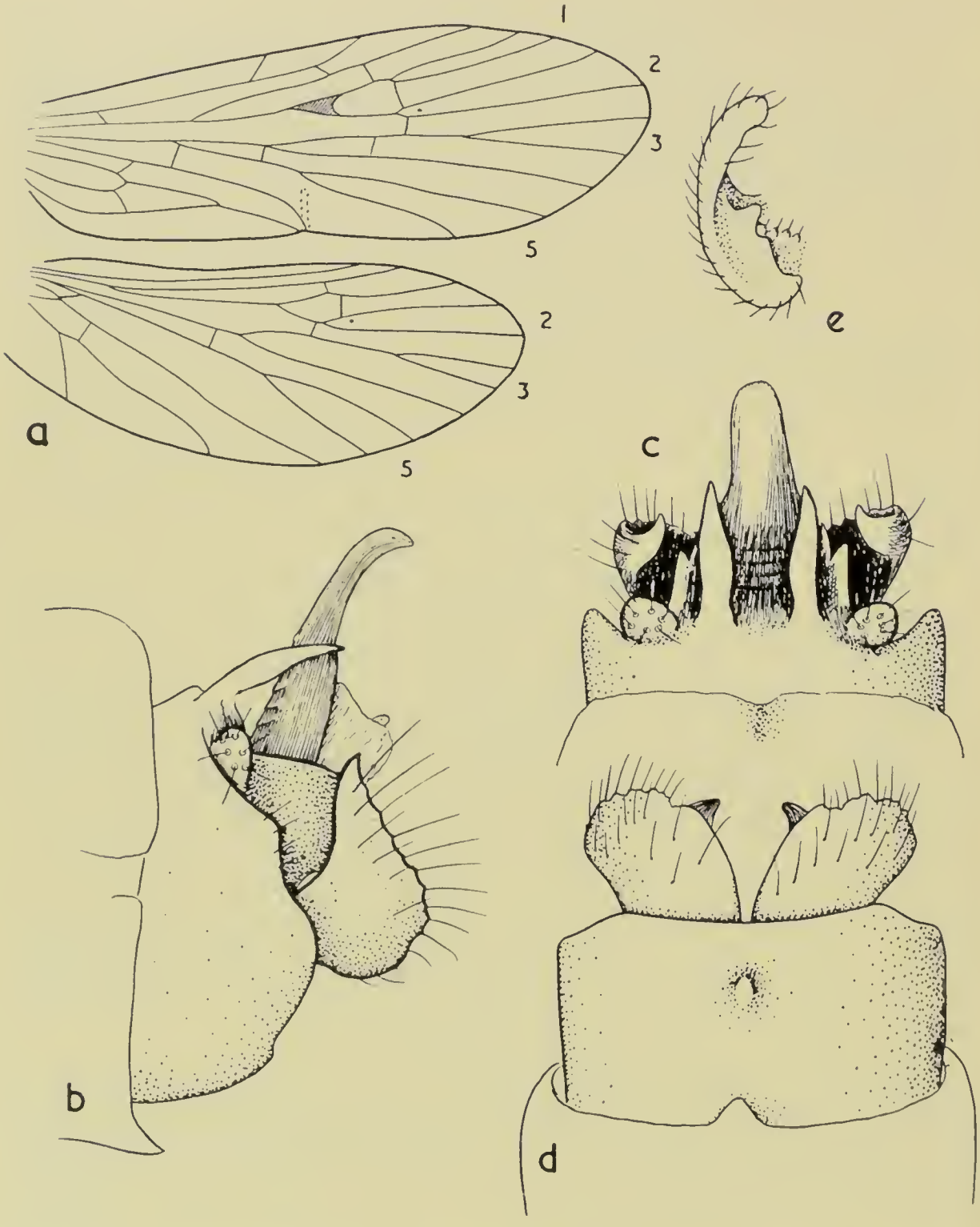

FIG. 273.—*Chimarra uranka* sp. n. ♂. *a*, wings; *b*, genitalia, lateral; *c*, dorsal; *d*, ventral; *e*, left inferior appendage from behind, showing internal ridge.

[Black, *antennae*, *palpi*, *legs* and *wings* dark fuscous. *Neuration* much as in *C. monticola* sp. n., but fork no. 3 in both wings is longer in relation to its footstalk.

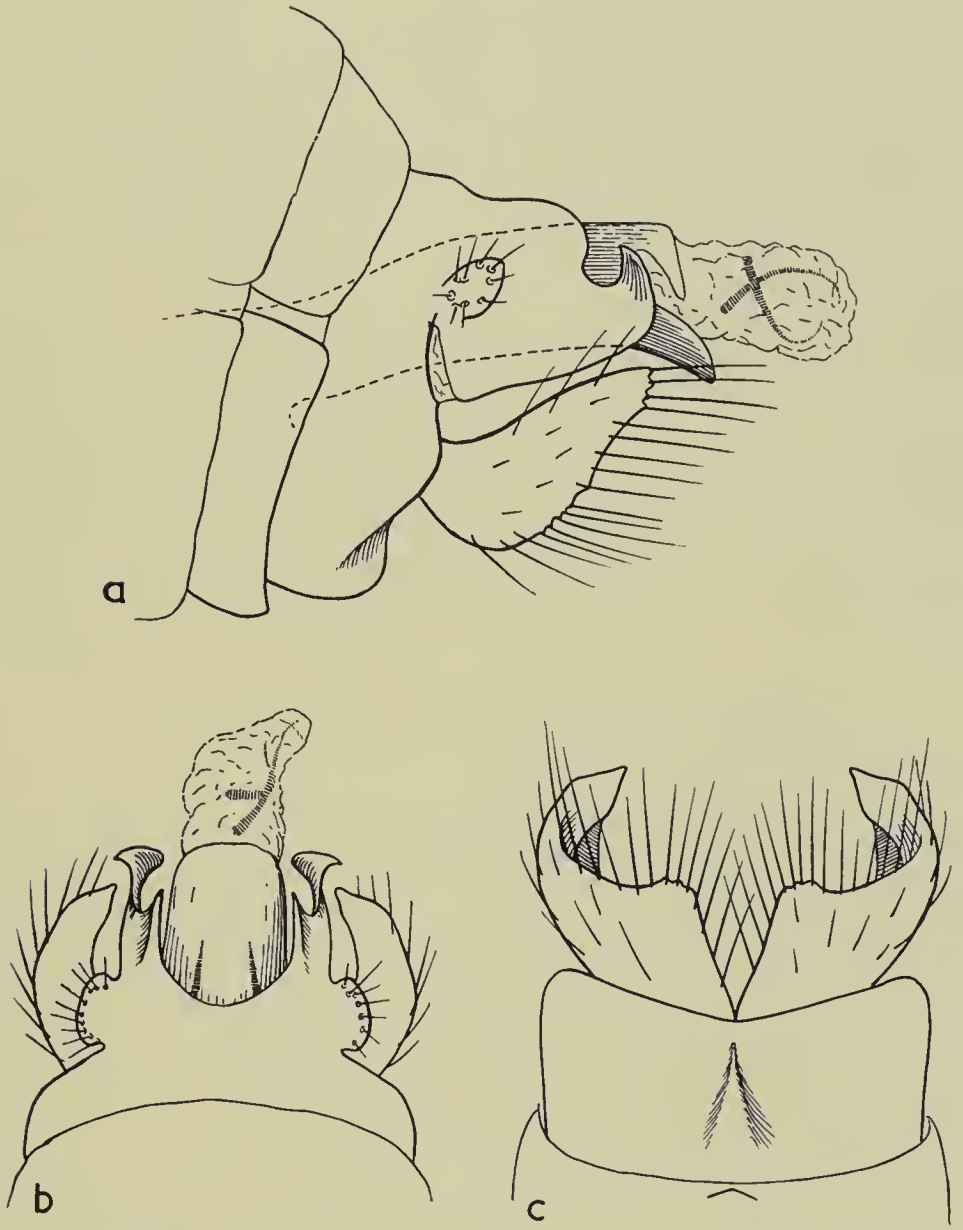

Fig. 274.—*Chimarra australica* (Ulmer). ♂ genitalia. *a*, lateral; *b*, dorsal; *c*, inferior appendages, ventral.

Genitalia, ♂.—From above, the ninth segment is produced to form an upper penis-cover, its distal margin widely and deeply excised. On each side at the base arises an ovate hairy lobe, possible a superior appendage. From the side the upper penis-cover is deep, its lower basal angles curving inward under the

penis and almost meeting. Its upper apical angle is produced upward and outward to make an acute hook and is separated from the remainder of the upper margin by an almost circular excision. Penis stout ; lower apical margin projecting in a lip. From the apex in a cleared example extends a membrane enclosing two slender, curved spines, and there are two more stouter and straighter spines within the penis about midway. Inferior appendages about as long as upper penis-cover, from the side narrow at the base, strongly dilated ventrally about midway and then tapering to the apex. From beneath they are broad at the base ; inner apical angle slightly produced and blunt, outer angle forming a strong curved process about as long as the basal part. Ninth segment beneath with a strong median longitudinal keel ; eighth sternite with a short, broad ventral process at the centre of the distal margin.

Length of anterior wing, 5 mm.

Australia : Queensland, Malanda (Ulmer) : Toowong, 9.ii, 4.iii.1897, Dodd ; Stradbroke I., 8.viii.1915, Tillyard Collection. New South Wales, Stanwell Park, 15–23.iv.1916, R. J. Tillyard. Federal Capital Territory, Brindabella, 23.iii.1930, J. W. Evans ; Blundell's, 18.ii.1931, A. L. Tonnoir ; Uriarra, Tinker's Creek, 13.iv.1930, L. F. Graham (C.S.I.R. Collection).

The *type* is in the Stockholm Museum, and was collected in alcohol. In dried examples the most noticeable feature of the genitalia is the pair of upturned hooks of the upper penis-cover, one on each side of the penis.—D. E. K.]

Chimarra monticola sp. n. (Kimmins) (fig. 275.)

Insect black ; *neuration* as figured.

Genitalia, ♂.—From above, distal margin of the ninth segment produced and widely excised. Superior appendages small and rounded from above, pointed and somewhat elongate from the side. Upper penis-cover, which is welded to the margin of the ninth segment, forms, from above, a pair of distally-directed, strong, calliper-shaped processes embracing the penis, joining the lower penis-cover beneath. Penis fleshy, with pigmented sides, produced beyond the margin of the ninth segment so that it might be mistaken for a dorsal plate. From the side it is directed slightly upward. Lower penis-cover formed by a pair of stout processes with rounded apices, extending about halfway up the penis. Inferior appendages stout at the base, cut back to more slender, calliper-shaped apices so as to leave an acute angle along the inner margin as seen from beneath. The distal margin of the eighth sternite is produced very slightly, but scarcely sufficiently to form a ventral process.

Length of anterior wing, 5·5 mm.

Australia : New South Wales, Rule's Point, 4450 ft., 30.xii.1934, 2 ♂, R. J. Tillyard.

Type. ♂, mounted as a microscope preparation. This species is closely related to *C. australica* Ulmer, but differs in the relative proportions of fork no. 3 and its footstalk in both wings, and in the absence of an upturned hook on the apex of the upper penis-cover.

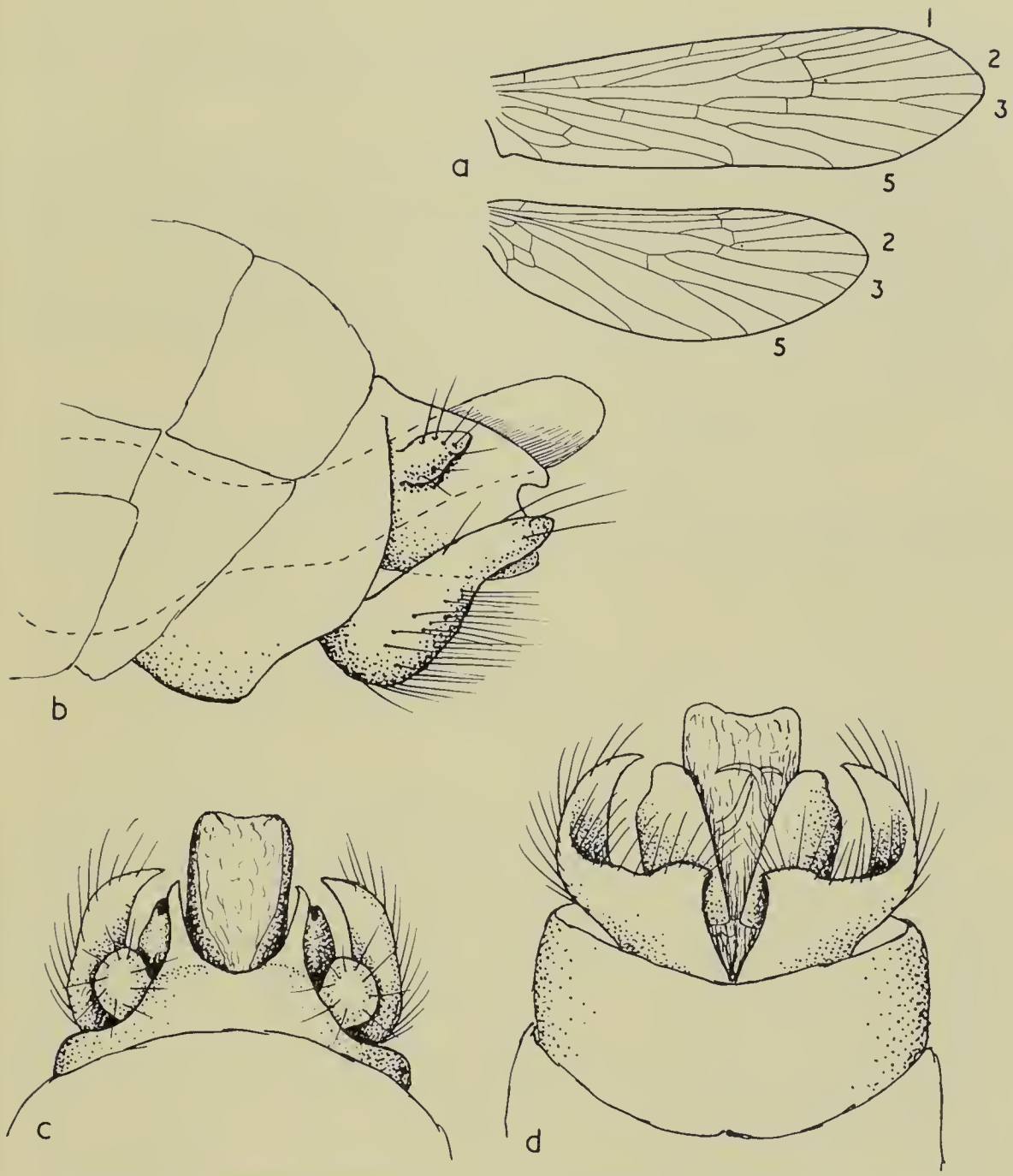

FIG. 275.—*Chimarra monticola* sp. n. ♂. *a*, wings ; *b*, genitalia, lateral ; *c*, dorsal ; *d*, ventral.

Chimarra australis (Navás).

Chimarrha australis Navás, 1923, *Arx. Inst. Cienc. Barcelona*, **7** : 203.

Navás' description is as follows :

" Similis *australiacae* Ulm.

Caput testaceum, pilis fulvis ; vertice tribus maculis nigris in triangulum

dispositis, subcontiguis, anteriore orbiculari, minore, posterioribus ellipticis, obliquis : oculis fuscis ; antennis fortibus, testaceo-fulvis, apicem versus obscurioribus.

Thorax fuscus, fulvo pilosus.

Abdomen fusco-fulvum, pilis fulvis.

Pedes testacei, calcaribus fuscis, longiusculis.

Alae fortiter irideae ; reticulatione fusco-ferruginea : membrana leviter fusco tincta ; fimbriis fuscis.

Ala anterior furca apicali 1 longa, angusta, 2 duplo longiore et latiore, sessili, 3 ramo anteriore plus duplo, posteriore sesquilongiore et amplius suo pedunculo ; 5 subaeque longa ac 3, sed latiore.

Ala posterior cellula discali angusta, triplo longiore quam latiore ; furca apicali 2 longa, duplo longiore 3 ; pedunculo furcae apicalis 3 subduplo longiore ramo anteriore, sesquilongiore posteriore ; furca 5 subduplo longiore 3, paulo latiore.

Long. corp ♀, 6 mm.
,, al. ant., 7·8 mm.
,, ,, post., 6·4 mm.

Patria. Austràlia. De Joannis. (Col. m.)

El tenia fa uns quans anys, i no havent pogut obtenir un ♂, m'he resolt a descriure l'espècie, creyent que els caràcters posats aqui seran bastants per a distingir-la."

I am unable to recognize this species from the description.

16. Fam. **RHYACOPHILIDAE** Stephens.

Stephens, 1836, *Ill. Brit. Ent. Mand.*, 6 : 154.
Ulmer, 1907, *Gen. Insect.*, 60a : 202.
McFarlane, 1951, *Rec. Canterbury Mus.*, 5 : 267–289, pls. 63–74 (N.Z. larvae).

Spurs 3, 4, 4 or 2, 4, 4, or 1, 4, 4. *Intermediate tibia* and *tarsus* of ♀ sometimes considerably dilated. *Antennae* slender, as long as or shorter than the anterior wing. Basal joint stout, shorter than the head. *Ocelli* present. *Maxillary palpi* alike in the sexes, five-jointed ; terminal joint not articulated. The first two joints very short, the following joints long, cylindrical. *Wings* elongate, vestiture variable ; neuration generally regular. Discoidal cell in both wings either open or closed, in hind wing sometimes wanting. *Anterior wing* with forks nos. 1, 2, 3, 4 and 5 ; R_1 generally forked at its apex. Thyridial cell always, median cell seldom present. An additional costal cross-vein sometimes present. *Posterior wing* shorter and narrower, forks variable, but at least nos. 2 and 5 present.

Key to Subfamilies.

1. Spurs 3, 4, 4 . . . . . *Rhyacophilinae* Ulmer.
(Not yet recorded from Australian Region.)
–. Spurs 2, 4, 4 or 1, 4, 4 . . . . . 2.
2. Fore wing with upright thickened hairs on the veins. Intermediate tibia and tarsus of ♀ not dilated . . . . . *Hydrobiosinae* Ulmer (p. 405).
–. Fore wing without upright, thickened hairs on the veins. Intermediate tibia and tarsus of ♀ generally considerably dilated *Glossosomatinae* Ulmer (p. 497).

Subfam. **HYDROBIOSINAE** Ulmer.

Ulmer, 1905, *Zeitschr. f. Wiss. Insektenbiol.*, 1 : 72.
Ulmer, 1907, *Gen. Insect.*, **60a** : 203.

Spurs 2, 4, 4 or 1, 4, 4. *Intermediate tibia* and *tarsus* of ♀ not dilated. Discoidal cell in *anterior wing* open or closed, in posterior wing always open, seldom entirely lacking. Thyridial cell of anterior wing present ; apical cells usually long and narrow. Fore wing always with erect, thickened hairs on the veins. Neuration of the ♂ sometimes differing from that of the ♀ and then irregular. *Posterior wing* with apical forks nos. 1, 2, 3 and 5, or 1, 3 and 5 or 1, 2 and 5 or 2, 3 and 5.

Key to Genera of *Hydrobiosinae*.

1. Discoidal cell in anterior wing closed, cross-vein sometimes weak . . . 2.
–. Discoidal cell in anterior wing open . . . . . 10.
2. Apical forks nos. 1, 2, 3 and 5 present in posterior wing . . . . . 3.
–. Apical forks nos. 2, 3 and 5 present in posterior wing . . . . . 8.
3. Fork no. 2 in anterior wing with a footstalk . *Hydrobiosis* McLachlan (p. 406).
–. Fork no. 2 in anterior wing sessile (sometimes divided into two cells by a cross-vein towards the base) . . . . . 4.
4. Median cell in anterior wing closed . . . . . 5.
–. Median cell in anterior wing open . . . . . 6.
5. Fork no. 3 in anterior wing sessile ; Cu_2 and 1A in posterior wing fused before the wing margin, enclosing an oblong cell . *Psilochorema* McLachlan (p. 425).
–. Fork no. 3 in anterior wing stalked ; Cu_2 and 1A in posterior wing run separately to the wing margin . . . . . *Ulmerochorema* gen. n. (p. 432).
6. In posterior wing of ♂, a narrow, cell-like structure, lined with fine hairs, situated between Cu_2 and 1A . . . . *Taschorema* Mosely (p. 434).
–. No such structure in posterior wing of ♂ . . . . . 7.
7. No short lateral filaments to the fifth abdominal segment. In ♂ a scent-organ situated between the second and third abdominal sternites *Notiobiosis* Banks (p. 444).
–. Short lateral filaments to the fifth abdominal segment. In ♂ no scent-organ between second and third abdominal segments . *Anachorema* gen. n. (p. 453).
8. A secondary fusion of R_1 with R_5 in the anterior wing, enclosing the facetic spot in a small cell . . . . . *Synchorema* Tillyard (p. 460).
–. No such secondary fusion of R_4 and R_5 . . . . . 9.
9. Apical fork no. 1 in anterior wing with a footstalk ; neuration differing in the sexes . . . . . *Neurochorema* Tillyard (p. 465).
–. Apical fork no. 1 in anterior wing sessile ; neuration similar in the sexes *Hydrochorema* Tillyard (p. 469).
10. Apical forks nos. 1, 2, 3 and 5 in posterior wing . . . . . 11.
—. Apical forks nos. 1, 2, 3 and 5 not *all* present in posterior wing . . . 12.
11. Fifth abdominal segment without lateral filaments (New Zealand) *Costachorema* McFarlane (p. 473).
—. Fifth abdominal segment with lateral filaments (Australia) *Austrochorema* gen. n. (p. 481).
12. Fork no. 3 present in posterior wing . . . . . 13.
—. Fork no. 3 absent in posterior wing . . . *Tiphobiosis* Tillyard (p. 486).
13. Forks nos. 1, 3 and 5 present in posterior wing . . . . . 14.
—. Forks nos. 2, 3 and 5 present in posterior wing . . . . . 15.
14. Footstalks of forks nos. 3 and 4 in anterior wing bowed outward to enclose a nearly circular area . . . . . *Allobiosis* gen. n. (p. 484).

—. Footstalks of forks nos. 3 and 4 in anterior wing parallel
Psyllobetina Banks (p. 485).

15. Forks nos. 2 and 3 in posterior wing of about equal length. ♂ anterior wing without a pouch or fold on the media . . . *Allochorema* gen. n. (p. 491).

—. Fork no. 2 about twice as long as no. 3 in posterior wing. ♂ anterior wing with an oblique pouch or fold on media and a fringe of long hairs on stalk of fork no. 1 . . . . . *Bachorema* gen. n. (p. 493).

Hydrobiosis McLachlan.

Hydrobiosis McLachlan, 1868, *Journ. Linn. Soc. Lond. Zool.*, 10 : 206.
Hydrobiosis Hutton, 1899, *Trans. N. Zeal. Inst.*, 31 : 246.
Hydrobiosis Hudson, 1904, *N. Zeal. Neur.* : 85.
Hydrobiosis Ulmer, 1907, *Gen. Insect.*, 60a : 204.
Hydrobiosis Tillyard, 1924, *Trans. N. Zeal. Inst.*, 55 : 286, text-fig. 1.

McLachlan describes the genus as follows :

" *Head—antennae* slender, as long as the wings ; basal joint shorter than the head, stout : *vertex* transverse, hairy : *ocelli* present : *eyes* prominent, large : *maxillary palpi* long and pubescent : the two basal joints short and stouter than the others, the second being the longer : third and fourth long and slender, nearly equal in length ; fifth not so long as the two preceding, united, and still more slender : *labial palpi* very small, the three joints nearly equal.

" *Thorax—prothorax* concealed ; *mesothorax* large, slightly hairy, the lateral angles prominent, the scutellum raised and elongate, with a depression on each side ; *metathorax* narrower than the widest portion of the mesothorax, the lateral lobes somewhat rounded."

" *Legs* long and slender : tibiae and tarsi not dilated in the ♀, slightly provided with spines in both sexes : tarsi slender, the joints with short spines at the apex ; claws rather long ; spurs 2, 4, 4 ; the pair on the anterior tibiae are small, the two pairs on the intermediate and posterior tibiae long and straight, nearly equal, the subapical pair placed at about four-fifths of the length from the base."

" *Wings— anterior wings* elongate, the costal and dorsal margins nearly parallel, the apex longly elliptical ; clothed with woolly pubescence, and with longer hairs on the veins ; fringes short ; *neuration* not very distinct ; subcosta straight, joining the costa a little beyond the middle ; radius running parallel with the subcosta into the apical portion of the costa, and ending in a long fork, somewhat bent before the point of furcation, connected with the subcosta at about the middle of the wing by a transverse veinlet ; discoidal cell short and triangular, closed ; apical forks 1, 2, 3, 4, and 5 all present ; fork 1 very long ; a transverse veinlet unites the upper branch of the ramus discoidalis, at the point of furcation, with the radius ; another unites the lower edge of the discoidal cell with the ramus thyrifer ; another, placed much further towards the base, closes the cellula thyridii ; and one also unites the fork of the ramus clavalis with the cubitus ; pterostigma concave beneath : *posterior wings* shorter and broader than the anterior, folded, rounded at the apex : fringes long on the dorsal margin : hairy clothing slight, hence the wings are subhyaline ; neuration more distinct ; subcosta and radius running close together ; apical forks 1, 2, 3, and 5 present ; no closed discoidal cell ; a transverse veinlet unites the upper branch of the ramus discoidalis with the radius ; a second unites the lower branch of this ramus with the ramus subdiscoidalis ; and a third is placed below this, much nearer the base of the wing."

"*Abdomen* slender in the ♂, more robust in the ♀; the last ventral segments with projecting teeth; appendices very complicated. (♂♀)."

"The genus is allied to *Psilochorema*, but is nevertheless quite distinct."

In all the species so far described, the base of the penis is more or less coiled.

Type species.—*Hydrobiosis frater* McLachlan, 1868.

Key to Species of *Hydrobiosis*.

1. ♂ (*ingenua* not recognizable) . . . . . 2.
–. ♀ (♀ of *gollanis*, *kiddi*, *styx* not known, *harpidiosa*, *silvicola*, *spatulata*, *clavigera*, *charadraea* not figured) . . . . . 13.
2. Ninth sternite with a spatulate process arising from basal margin. . . 3.
–. Ninth sternite without such process . . . . . 4.
3. Inferior appendage constricted and incurved beyond midway, but not angled abruptly upwards . . . . . *H. styx* McFarlane* (p. 537).
–. Inferior appendage from side abruptly angled upwards about midway *H. spatulata* McFarlane* (p. 533).
4. Inferior appendage with a flattened branch arising on the inner, lower surface towards base . . . . . 5.
–. Inferior appendage unbranched, but sometimes with an internal keel or flange 7.
5. Inferior appendage from side with main branch stout, almost straight, from beneath with inner branch about one-third as long as main branch *H. gollanis* sp. n. (p. 408).
–. Inferior appendage from side with main branch slender, strongly arched, from beneath with inner branch about half as long as main branch . . . 6.
6. Superior appendage slender, with clavate apex; inferior appendage from beneath with inner branch rather narrow, not much wider than outer *H. umbripennis* McLachlan (p. 408).
–. Superior appendage slender, scarcely dilated at apex; inferior appendage from beneath with inner branch much wider than outer *H. parumbripennis* McFarlane (p. 415).
7. Inferior appendage short and broad, not longer than ninth segment *H. harpidiosa* McFarlane* (p. 533).
–. Inferior appendage more elongate . . . . . 8.
8. Superior appendage cleft at apex, inner fork forming an inwardly directed claw . . . . . *H. frater* McLachlan (p. 418).
–. Superior appendage not cleft apically . . . . . 9.
9. Ventral process of seventh sternite very small . . . . . 10.
–. Ventral process of seventh sternite strong and conspicuous . . . . 11.
10. Inferior appendages from beneath calliper-like . *H. clavigera* McFarlane* (p. 536).
—. Inferior appendages from beneath not incurved at apices . *H. soror* sp. n. (p. 421).
11. Inferior appendage from side sinuous. . . . . 12.
—. Inferior appendage from side somewhat tapered towards apex but not sinuous *H. charadraea* McFarlane* (p. 537).
12. Inner flange of inferior appendage scarcely reaching to midway *H. kiddi* McFarlane* (p. 533).
—. Inner flange of inferior appendage extending beyond midway *H. silvicola* McFarlane (p. 416).
13. Distal margin of seventh sternite with a deep, narrow, median excision *H. umbripennis* McLachlan (p. 408).
—. Distal margin broadly concave or sinuous . . . . . 14.

* See Appendix.

14. Process of fifth sternite long and slender ; seventh sternite heavily pigmented *H. soror* sp. n. (p. 421).
—. Process of fifth sternite not long and slender ; seventh sternite not heavily pigmented . . . . . 15.
15. Eighth sternite from beneath elongate-triangular, about twice as long as broad . . . . . *H. frater* McLachlan (p. 418).
—. Eighth sternite broadly triangular, about as broad as long *H. parumbripennis* McFarlane (p. 415).

Hydrobiosis styx McFarlane.

(See Appendix, p. 537.)

Hydrobiosis spatulata McFarlane.

(See Appendix, p. 533.)

Hydrobiosis gollanis sp. n. (fig. 276).

This species very closely resembles *Hydrobiosis umbripennis* McLachlan, though the insect is somewhat smaller. The differences in the *neuration* are negligible. In the *genitalia* of the ♂ there are various slight differences which will be best appreciated by a comparison of the figures. The short processes at the base of the dorsal plate in *umbripennis* are lacking in *gollanis*. The upper penis-cover differs considerably in form, and variation will also be found in the inferior appendages and in the ventral process.

The species also resembles *parumbripennis*. Here again a comparison of the figures of the genitalia shows slight differences in structure and, moreover, here there is an appreciable variation in neuration, particularly in the length of fork no. 1 of the posterior wing.

♀ unknown.

Length of the anterior wing, ♂, 8 mm.

New Zealand : Gollans Valley, 24.xii.1934, 1 ♂, G. V. Hudson.

The differences between this species and *H. umbripennis* McLachlan and *H. parumbripennis* McFarlane are set out in the above description.

Hydrobiosis umbripennis McLachlan (figs. 277, 278).

Hydrobiosis umbripennis McLachlan, 1868, *Proc. Linn. Soc. Lond., Zool.*, **10** : 208, 209, 213, pl. 2, figs. 9*c–d*.
Hydrobiosis umbripennis McLachlan, 1873, *Ann. Mag. Nat. Hist.*, (4) **12** : 41.
Hydrobiosis umbripennis Hutton, 1899, *Trans. N. Zeal. Inst.*, **31** : 246.
Hydrobiosis umbripennis Hudson, 1904, *N. Zealand Neur.* : 86, pl. xi, figs. 11–13.
Hydrobiosis umbripennis Ulmer, 1907, *Gen. Insect.*, **60a** : 205, pl. 27, fig. 247.
Hydrobiosis umbripennis Tillyard, 1924, *Trans. N. Zeal. Inst.*, **55** : 287, fig. 1.
Hydrobiosis umbripennis Tillyard, 1926, *Ins. Austr. N.Z.* : 391, pl. 26, fig. 4.

McLachlan describes the species as follows :

"*Head—antennae* yellow, with indistinct fuscous annulations, basal joint with whitish hairs in the ♂, and testaceous in the ♀ ; *vertex* fuscous, the raised posterior edge, and a rounded tubercle on each side within the lateral ocelli, paler, more reddish ; a line of whitish hairs along the middle, and blackish hairs on the

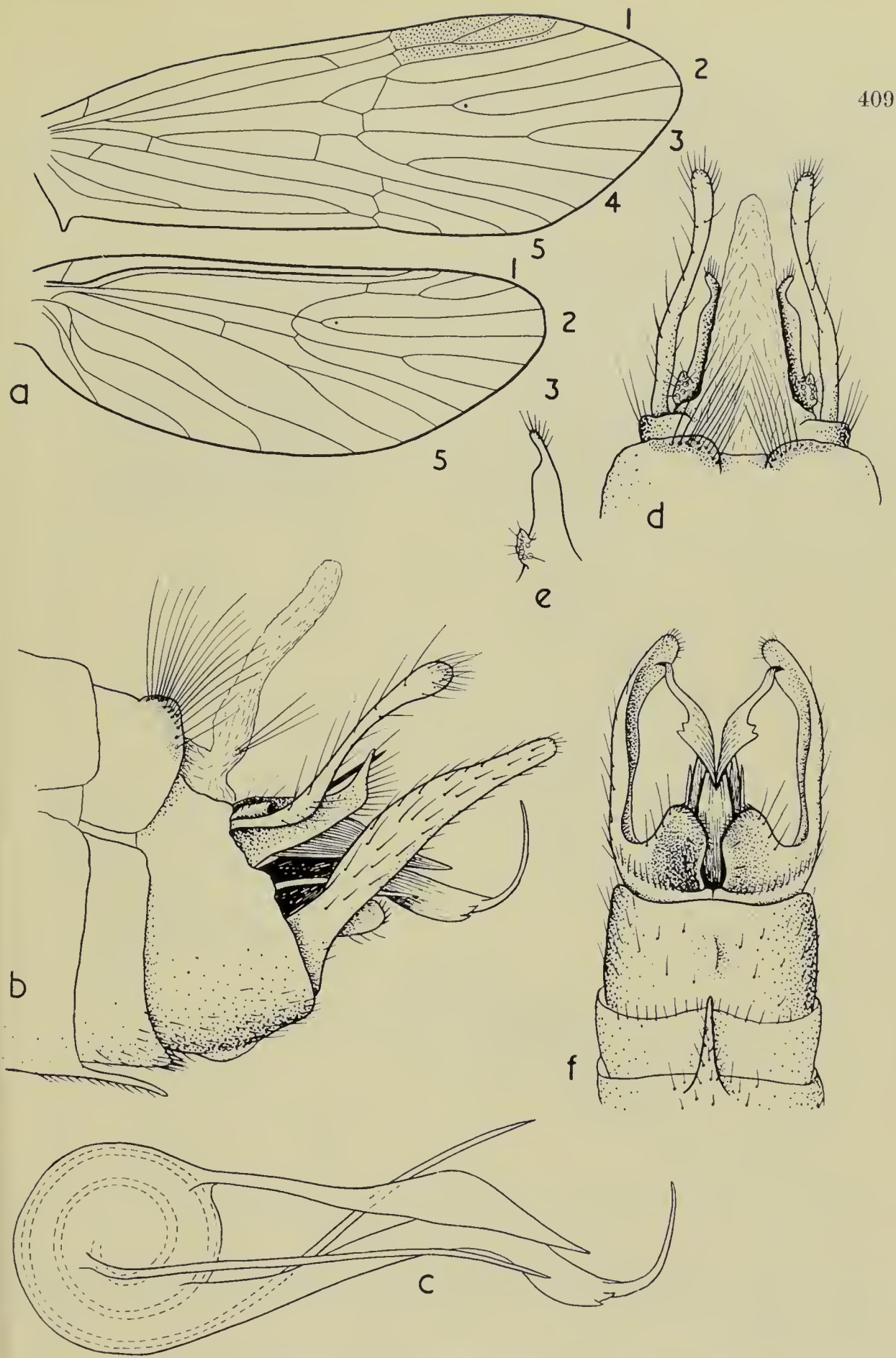

FIG. 276.—*Hydrobiosis gollanis* sp. n. ♂. *a*, wings ; *b*, genitalia, lateral ; *c*, penis, etc., lateral ; *d*, genitalia, dorsal ; *e*, upper penis-cover, dorsal ; *f*, genitalia, ventral.

sides, but the middle hairs are sometimes testaceous in the ♀; *ocelli* very large and conspicuous, pale-yellow; *eyes* black, with curved gilded lines; *face* with whitish and blackish hairs intermingled; *palpi* yellowish, fuscescent externally, with yellowish pubescence."

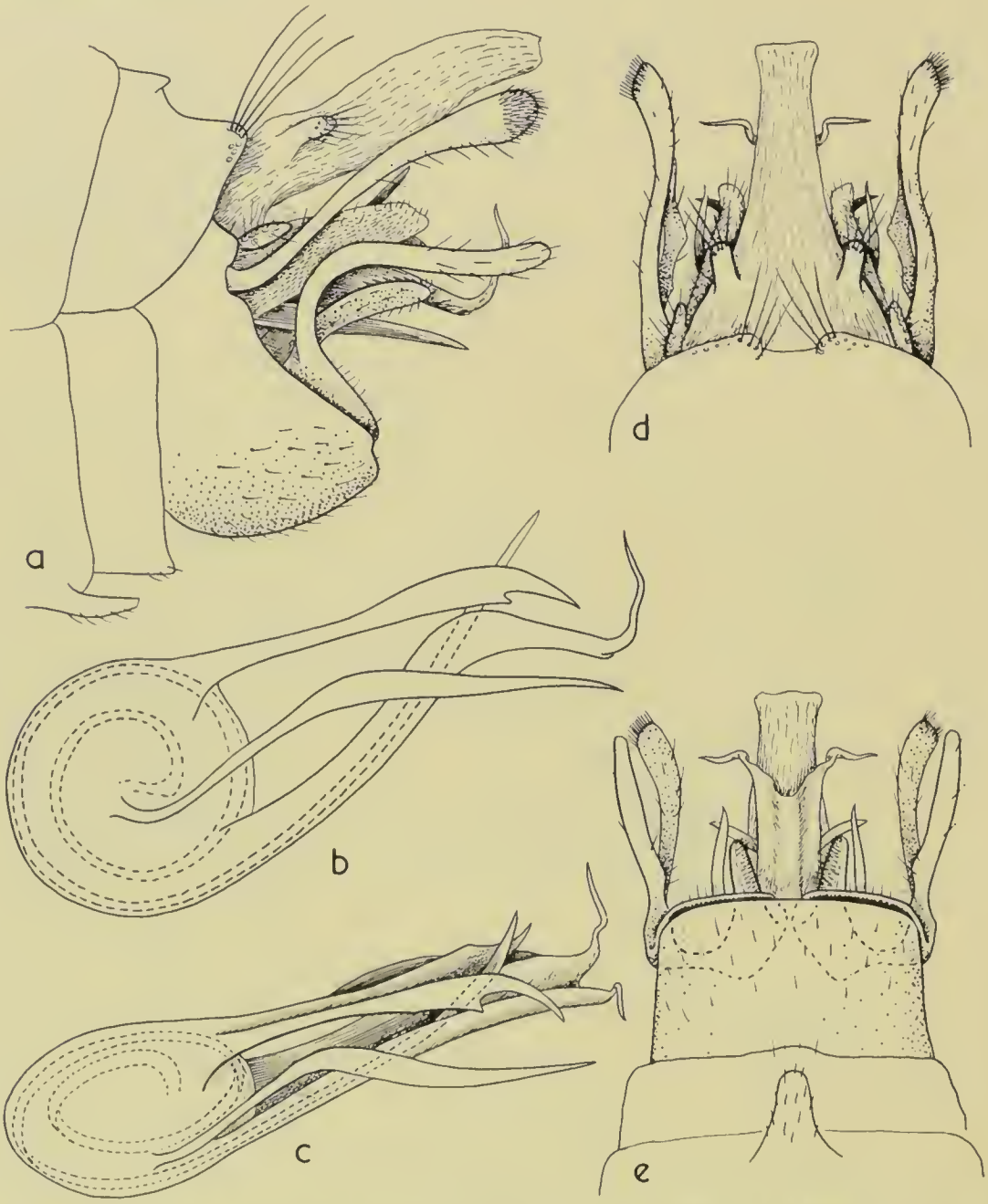

FIG. 277.—*Hydrobiosis umbripennis* McLachlan. ♂. *a*, genitalia, lateral; *b*, penis, etc., lateral; *c*, the same, dorso-lateral; *d*, genitalia, dorsal; *e*, ventral.

"*Thorax—mesothorax* dark castaneous, the disk nearly hairless, but with blackish hairs on the wing-shoulders; *metathorax* rather paler, the *metascutellum* depressed and obovate."

" *Wings—anterior wings* brown, with blackish and whitish hairs (placed principally on the veins) intermingled, but the clothing is much less dense than in *H. frater* ; in both sexes there are tufts of black hair along the cubitus near the base, a row of

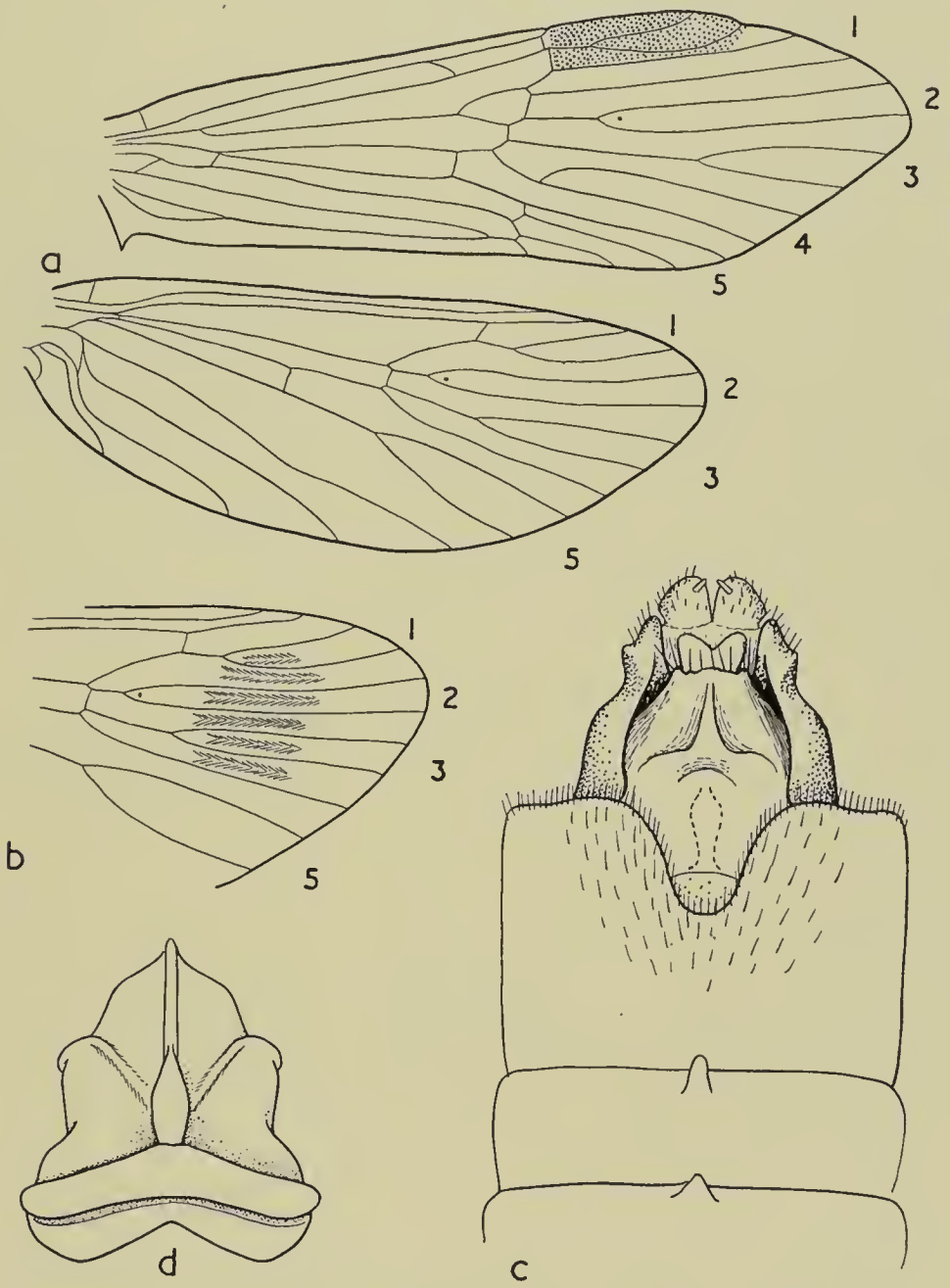

FIG. 278.—*Hydrobiosis umbripennis* McLachlan. *a*, ♂ wings ; *b*, apex of ♀ posterior wing ; *c*, ♀ genitalia, ventral ; *d*, vaginal structure, ventral (more enlarged).

yellowish dots round the apical margin, and the fringe is also yellowish opposite to these spots, otherwise it is brown, and concolorous with the membrane ; pterostigma darker, elongate ; neuration pale-yellowish, testaceous ; the first apical cellule

extending to the anastomosis ; second shorter, thus having a short footstalk ; third, only one-third the length of its footstalk ; fourth and fifth as long as the second : *posterior wings* pale-smoky subhyaline, with smoky pubescence, the margins with a yellowish reflection ; fringes mostly greyish-yellow, but intermixed with blackish ; neuration very distinct ; the first apical cellule extending almost from the transverse veinlet to the radius ; second very long, reaching nearly to the base of the principal fork of the ramus discoidalis ; third about as long as the first."

" *Legs* pale testaceous ; the *anterior tibiae* and *tarsi* slightly fuscescent externally, with paler rings."

"*Abdomen* fuscous above, yellowish beneath, with scattered yellowish hairs ; the ♂ has but one ventral tooth, which is long, and placed on the apical margin of the penultimate segment ; the ventral surface ends in a large valve, truncated when viewed from beneath, the sides slightly concave, and emitting the app. inf., which are spine-like and curved round in a semicircular manner ; the apex of the dorsal surface ends in a tuft of hairs, beneath which proceeds a long lobe curved at its extremity ; on each side of this lobe is a small slender appendice, which may be called the app. intermed. ; the app. sup. are long and slender, curved downwards at the tips, which are slightly dilated and rounded ; beneath the lobe are seen two pairs of sheaths, the upper pair being needle-like, very slender, and much twisted, the lower pair shorter, abruptly turned outwards at the tip ; these sheaths probably conceal the penis, which is not evident in my dead specimens. In the ♀ there is a tooth on the penultimate ventral segment, as in the ♂, but it is smaller ; the last ventral segment is deeply notched in the middle of the apex ; the parts protruding from the ill-defined cavity formed by the last dorsal and ventral segments are not clearly definable. (Pl. II, figs. 9*c*, *d*)."

" Long. corp. ♂ 4‴, ♀ 5‴ ; exp. alar. ♂ 11‴, ♀ 12–13‴."

" [New Zealand] Christchurch, Canterbury (*Fereday*) ; 2 ♂, 4 ♀."

McLachlan states that there is a tooth on the penultimate ventral segment in the ♀. I find, however, that there is a tooth on the antepenultimate segment as well.

I give here a further description of the ♂ *genitalia* made from a specimen cleared in KOH.

Apical margin of the eighth tergite with a membranous centre, which is bordered on each side by tufts of hair. The margin of the ninth tergite is produced at its centre in a semi-transparent plate, directed tailward and slightly upward, wide at the base, tapering to a truncate apex. On the upper surface, towards the base, is a pair of small processes with rounded apices fringed with hairs. Superior appendages long, sinuous, with slender stems and dilated apices which bear a mat of hairs on their outer surfaces. Upper penis-cover takes the form of a pair of triangular or cone-shaped processes, the surfaces covered with minute spicules and with small, elongate warts or processes on the upper surfaces towards the base. Penis coiled at the base with a slender, upwardly directed duct and with various spines which no doubt represent sheaths and lower penis-cover. Inferior appendages branched ; inner branch short, arching, covered with small teeth on its inner surface ; the outer longer than the inner, with a semicircular bend at the middle. A stout process to the seventh sternite.

The ♀ may be recognized by the examination of the vestiture of the posterior

wing, when it will be found that there are small patches of short, yellow, converging hairs occupying the first six apical cellules towards the apex of the wing, and by the deeply notched apical margin of the seventh sternite.

Type, ♂ (with the abdomen mounted in balsam), in the British Museum (N.H.) (from the McLachlan Collection).

Hudson writes:

"The larva of this insect inhabits clear, rapid streams and swims with great activity amongst the stones. It is carnivorous, chiefly feeding on small May-fly larvae. The larvae of *H. umbripennis* are found in the streams throughout the year, but are commonest in the spring and early summer, only very small specimens occurring in the autumn and early winter."

"The length of the larva when full grown is a little less than $\frac{3}{4}$ inch. The head and prothorax are very horny, narrow, and pale brown in colour. The rest of the insect is dull green, and very soft. The segments of the abdomen gradually decrease in size towards the posterior extremity. The terminal appendages are slender, and are each furnished with a pair of strong hooks. The anterior legs are very stout, the tibia and tarsus being modified into two prehensile claws, which are employed by the larva in capturing its prey. I have been unable to detect any traces of external gills in this larva."

"Unlike most of the caddis-fly larvae, this insect does not live in any kind of case, but swims about the streams entirely unprotected, during the whole of its larval life. When full grown, however, it constructs a compact, oval cocoon of rather small stones, which is firmly affixed to the surface of a boulder in the bed of the stream. These cocoons are very hard so long as they remain intact, but when once they are injured in any way they immediately collapse. Inside the stone cocoon the larva invests itself in an oval, semi-transparent envelope, somewhat resembling in appearance thin horn or gelatine. Through this inner cocoon the enclosed insect may be readily seen, and may at once be identified by means of its long, narrow head, which is curved downwards and laid upon the breast of the insect. The creature remains in this transition stage for many days, during which it frequently turns itself round inside the gelatine cocoon. Finally, however, it is transformed into a light green pupa of extreme delicacy. In fact, this pupa is so fragile and soft that it is seldom possible to extract it from the inner cocoon without inflicting the most serious injuries. As the enclosed insect develops, the gelatine cocoon becomes more and more opaque; thus the final stages of the pupa are not clearly discernible. The mature pupa emerges through an opening in one end of the inner cocoon, but practically leaves no visible sign of its means of exit from the outer stone cocoon. When free, the pupa always swims about in the water for several hours before it gives rise to the winged fly."

"The perfect insect is fairly common in the vicinity of streams, and may sometimes be taken at light."

"During the late spring and early summer I have observed that large numbers of the stone cocoons, constructed by the larvae of this species and its allies, are invariably left high and dry on the boulders situated at the edges of rivers. This circumstance is due to the shrinkage in the volume of water, which nearly always takes place at that season, leading of course to the destruction of very large numbers of the living pupae, which are then within the dried-up cocoons. It is, however, somewhat remarkable that this extensive and constantly recurring destruction has not led to the exclusive preservation of larvae endowed with an instinct to fix their

cocoons in deep water some distance from the edge of the stream, but such a beneficial instinct does not yet appear to have been universally produced. These remarks will apply with equal force to *Olinga feredayi*, the extensive mortality of which insect has already been noticed."

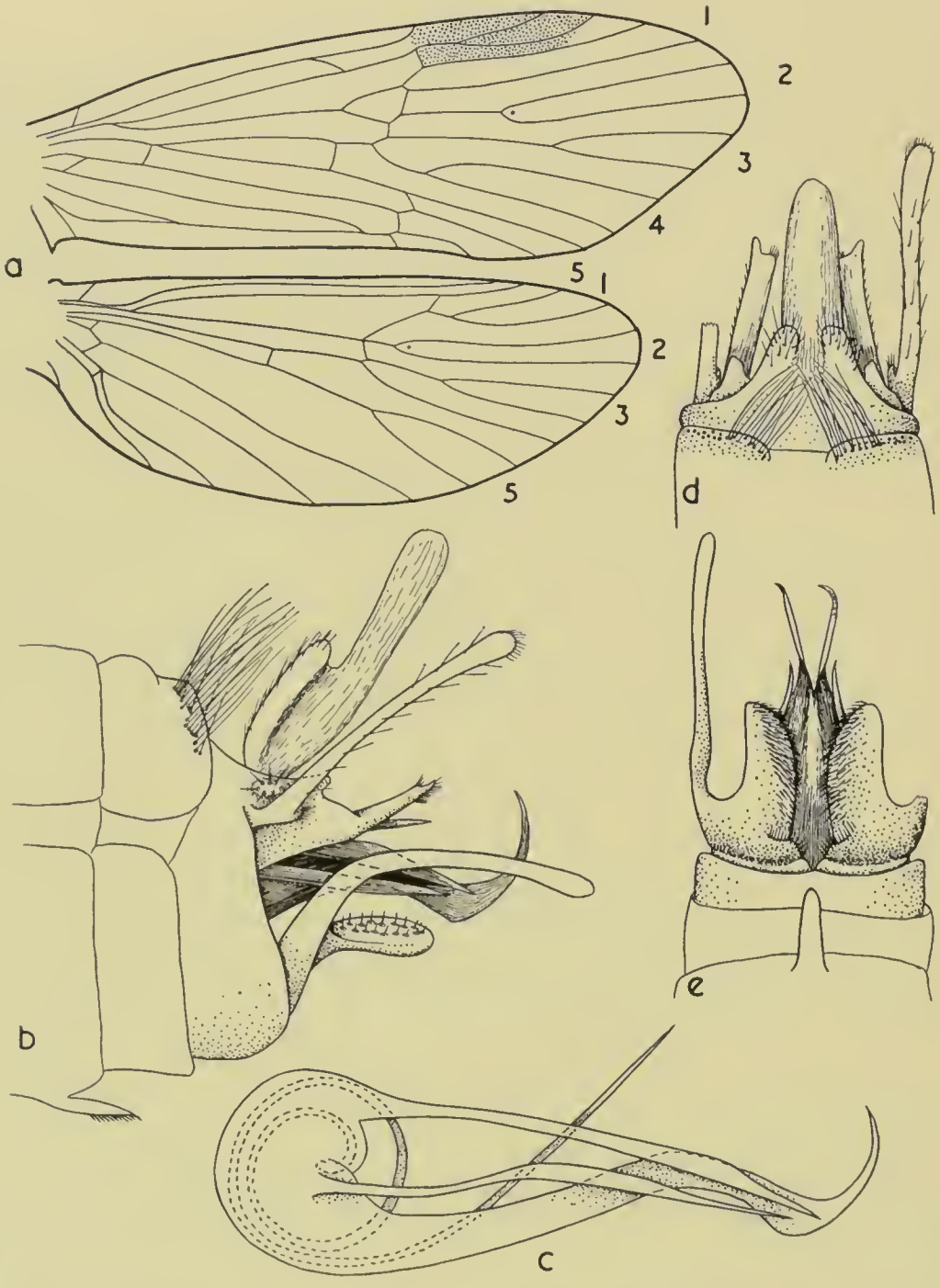

Fig. 279.—*Hydrobiosis parumbripennis* McFarlane. ♂. *a*, wings; *b*, genitalia, lateral; *c*, penis, etc., lateral; *d*, genitalia, dorsal; *e*, ventral.

Hydrobiosis parumbripennis McFarlane (figs. 279, 280).

Hydrobiosis umbripennis McLachlan, 1868, *Proc. Linn. Soc., Zool.*, **10** : 228 (partim ♀♀).
Hydrobiosis parumbripennis McFarlane, 1951, *Rec. Canterbury Mus.*, **5** : 256, pl. 56, figs. 1–4.

Head fulvous, elothed with intermixed blaek and fulvous hairs. Oeuli fulvous. *Palpi* and *legs* light fulvous, the latter paler at the apiees of the

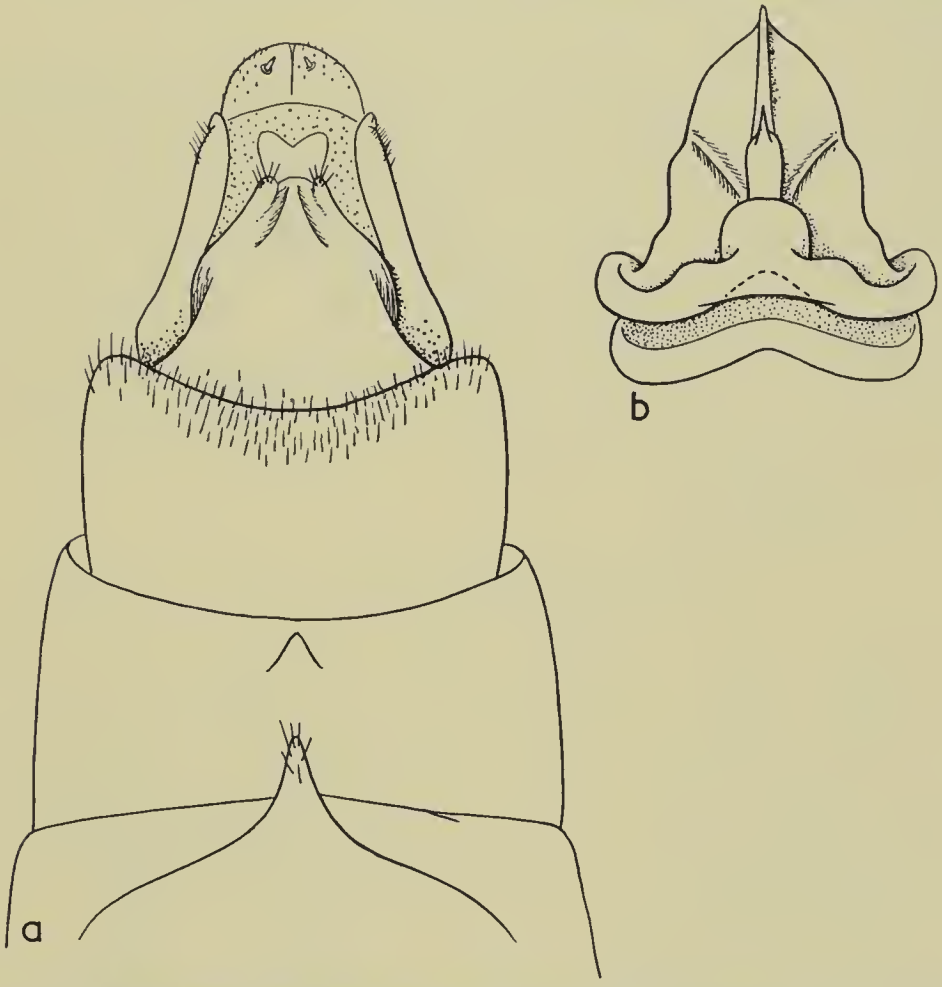

Fig. 280.—*Hydrobiosis parumbripennis* McFarlane. ♀ genitalia, ventral and vaginal structure (more enlarged).

tarsal joints. *Wings* light fulvous, the anterior with numerous erect, blackish hairs.

Genitalia, ♂.—Apical margin of the eighth dorsal segment with a membranous eentre, the rest strongly chitinized and fringed with a mass of long hairs. The margin of the ninth segment is produeed in a long and narrow, membranous dorsal plate, direeted slightly upward from the side. Welded to its upper surfaee is a pair of proeesses ; these are fairly stout, the apiees fringed with hairs, whieh extend down the outer margin. Superior appendages long and slender,

apices very slightly dilated. Upper penis-cover in the form of a pair of processes arising from a broad base with excised apices, of which the outer angles are produced. Penis coiled at the root and with a slender, pointed duct and various sheaths or spines ; apex in the form of a pair of sickle-shaped spines curving upwards. Inferior appendages branched ; upper branch very long and slender, about twice the length of the lower, which is wide ; apex obliquely rounded and set with numerous black bristles. A stout process to the seventh ventral segment.

Length of anterior wing, ♂, 10 mm.

New Zealand : Wilton's Bush, 9.ii.1933 1.xii.1920, Wellington, Day's Bay, 22.xii.1932, Wainuiomata, xii.1932, Karori 1.i.1899, Wellington, G. V. Hudson : Christchurch, Fereday : White Rock, xi.1921, Ohakune, 20.iii.1922, T. R. Harris.

Types in the Canterbury Museum. Two females from the type series of *H. umbripennis* McLachlan belong to this species, having the apical margin of the seventh sternite broadly concave. The distinction between this species and *H. umbripennis* is not very apparent in the male sex. In the female, however, the two species may easily be separated by the form of the margin of the seventh sternite, deeply excised at its centre in *umbripennis*, but broadly concave or sinuous in *parumbripennis*. There are also differences in the form of the vaginal structure.

Hydrobiosis silvicola McFarlane (fig. 281).

Hydrobiosis silvicola McFarlane, 1951, *Rec. Canterbury Mus.*, 5 : 258, pl. 58, figs. 12, 13.

Insect small. *Head* ochraceous, with dark fulvous mixed with shorter golden hairs. *Antennae*, basal joint light ochraceous, clothed with short golden hair, remaining joints dark ochraceous. *Palpi* ochraceous. *Legs* ochraceous. *Anterior wing* greyish, clothed with semi-erect, dark hairs ; pterostigma strongly fuscous. Various round, clear spots scattered over the wing particularly on the disk ; a large, clear spot at the arculus and, in the denuded wing, spots may be seen along the apical margin between the apical sectors. Neuration as in *Hydrobiosis umbripennis*.

Genitalia, ♂.—Apical margin of the ninth tergite produced at its centre in a membranous dorsal plate directed upward and tailward. Superior appendages, from above, sinuous, slender, about the same length as the dorsal plate, scarcely dilated at their apices. Upper penis-cover in the form of a pair of sinuous spines arising just above the bases of the superior appendages ; apices directed outwards from above, each with a small wart at its base. From the side, strongly elbowed, broadened at the base, upper margin fringed with stiff hairs. Penis coiled at its base, which is enveloped by what is probably a lower penis-cover, broad from above, apex excised ; a pair of long sheaths lying above it with diverging apices. Inferior appendages long and stout, sinuous from the side, excised towards the apex along the inner margin, as seen from beneath, with an angular projection at the lower end of the excision ; inner surface at the apex bearing short teeth, lower margin rather longer ones. Centre of the

apical margin of the eighth sternite slightly produced ; a strong process to the seventh sternite.

[♀. McFarlane writes as follows : " Female with long, strong tooth on antepenultimate sternite ; short, blunt tooth, penultimate sternite ; large

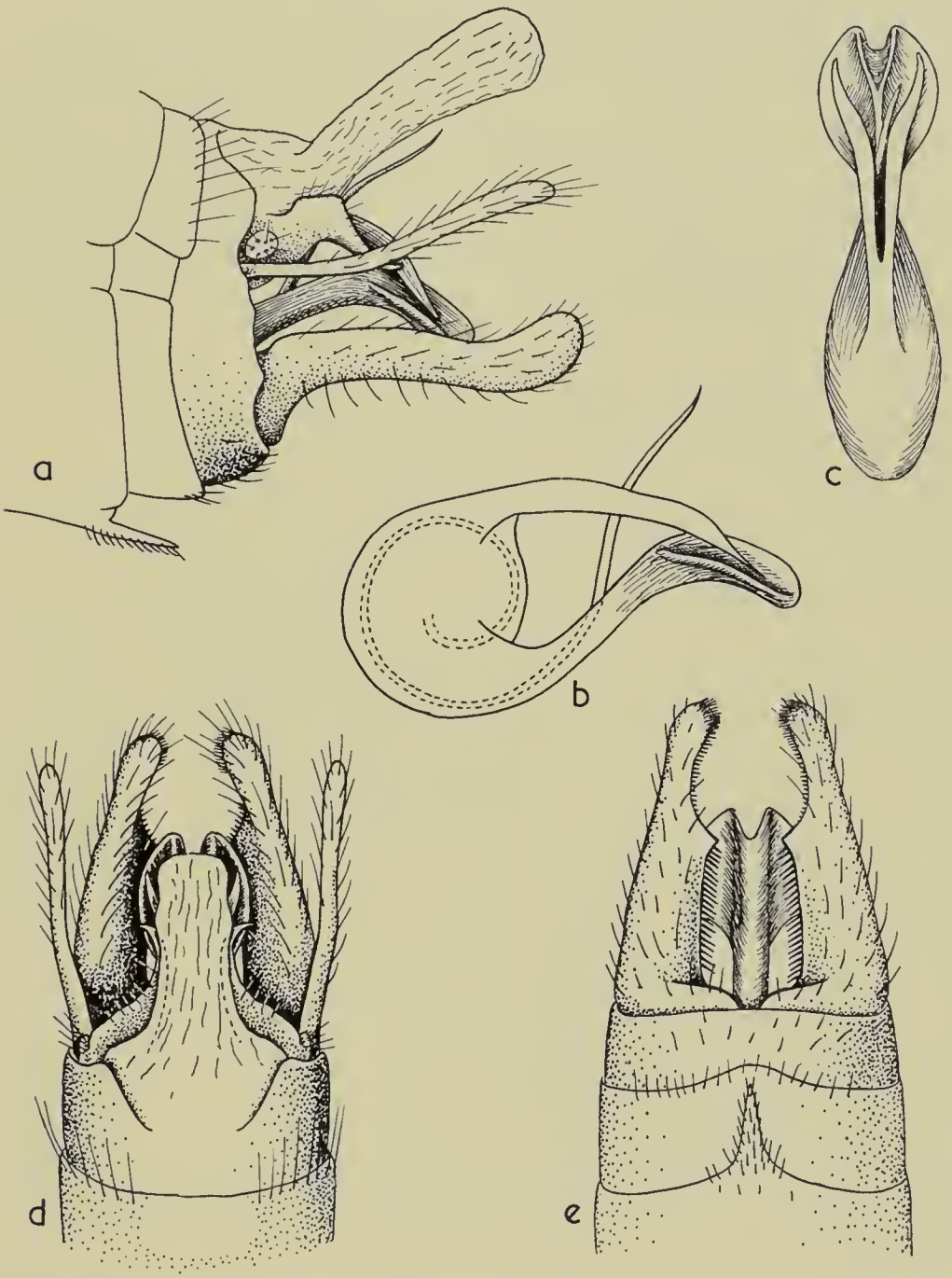

Fig. 281.—*Hydrobiosis silvicola* McFarlane. ♂. *a*, genitalia, lateral ; *b*, penis, etc., lateral ; *c*, penis, etc., dorsal ; *d*, genitalia, dorsal ; *e*, inferior appendages and lower penis-cover, ventral.

part of ultimate sternite free posteriorly, with small shallow notch in middle of a rounded margin."—D. E. K.]

Length of anterior wing, ♂, 8 mm.

New Zealand: Beech-forest streams, Craigieburn to Arthur's Pass, 1500–3000 ft. (McFarlane). Queenstown, 14.xii.1919 (Tillyard Collection).

[Types in Canterbury Museum. The foregoing description of the ♂ was made from the Queenstown example, now in the British Museum (N.H.).—D. E. K.]

Hydrobiosis kiddi McFarlane.

(See Appendix, p. 533.)

Hydrobiosis harpidiosa McFarlane.

(See Appendix, p. 533.)

Hydrobiosis frater McLachlan (figs. 282, 283).

Hydrobiosis frater McLachlan, 1868, *Journ. Linn. Soc. Lond. Zool.*, **10** : 207–8, 213, pl. 2, fig. 9*a*, *b*.
Hydrobiosis frater McLachlan, 1873, *Ann. Mag. n.H.* (4) **12** : 41.
Hydrobiosis frater Hutton, 1899, *Trans. N. Zeal. Inst.*, **31** : 246.
Hydrobiosis frater Hudson, 1904, *N. Zeal. Neur.* : 86.
Hydrobiosis frater Ulmer, 1907, *Gen. Insect.*, **60a** : 205.

McLachlan describes the species as follows :

"*Head—antennae* fuscous, with narrow yellowish annulations, the basal joint with cinereous hairs ; *vertex* blackish fuscous, clothed with blackish and cinereous hairs intermingled, as is also the face ; *ocelli* large, yellowish ; *eyes* brown, with blackish markings ; palpi fuscous, with hoary pubescence."

"*Thorax—prothorax* with blackish and cinereous hairs ; *mesothorax* blackish-fuscous with a tuft of blackish hairs on each wing-shoulder ; *metathorax* blackish-fuscous, almost hairless, the metascutellum forming a depressed elliptical space."

"*Wings—anterior wings* thickly clothed with long woolly, cinereous and blackish hairs intermingled, the former predominating : these hairs are principally placed on the veins in two series, those on one vein crossing those on the opposing ones ; a space on the middle of the dorsal margin is wholly pale cinereous, and there is an appearance of a like-coloured narrow transverse fascia before the apex ; tufts of longer black hairs along the dorsal margin in the ♂ only ; apical fringes forming alternating spaces of blackish and whitish cinereous hairs ; pterostigma elongate, fuscous ; neuration fuscous, the first apical cellule extending to, and slightly into, the discoidal cell ; second about half the length of the first ; third shorter than the second : fourth longer than the second, but shorter than the first ; fifth longer than the fourth : *posterior wings* pale-smoky subhyaline ; fringes blackish, but becoming whitish cinereous towards the base of the dorsal margin ; first apical fork short ; second longer, about half the length of its footstalk ; third slightly longer than the first ; fifth as long as the second (pl. II, fig. 9)."

"*Legs* testaceous ; *coxae* fuscous ; *anterior* and *intermediate tibiae* fuscous externally, with a narrow median pale ring ; *spurs* reddish-testaceous."

"*Abdomen* fuscous, yellowish beneath, and with yellow appendices ; in the ♂ there are three ventral teeth—one very small at the apex of the segment before the

antepenultimate, and a larger one at the apex of the antepenultimate and penultimate segments ; in the ♀ there is a tooth-like tubercle at the apex of the antepenultimate and penultimate segments ; the ♂ has a broad, obtuse, and flattened upcurved lobe proceeding from the margin of the last dorsal segment ; *appendices* of the ♂ very

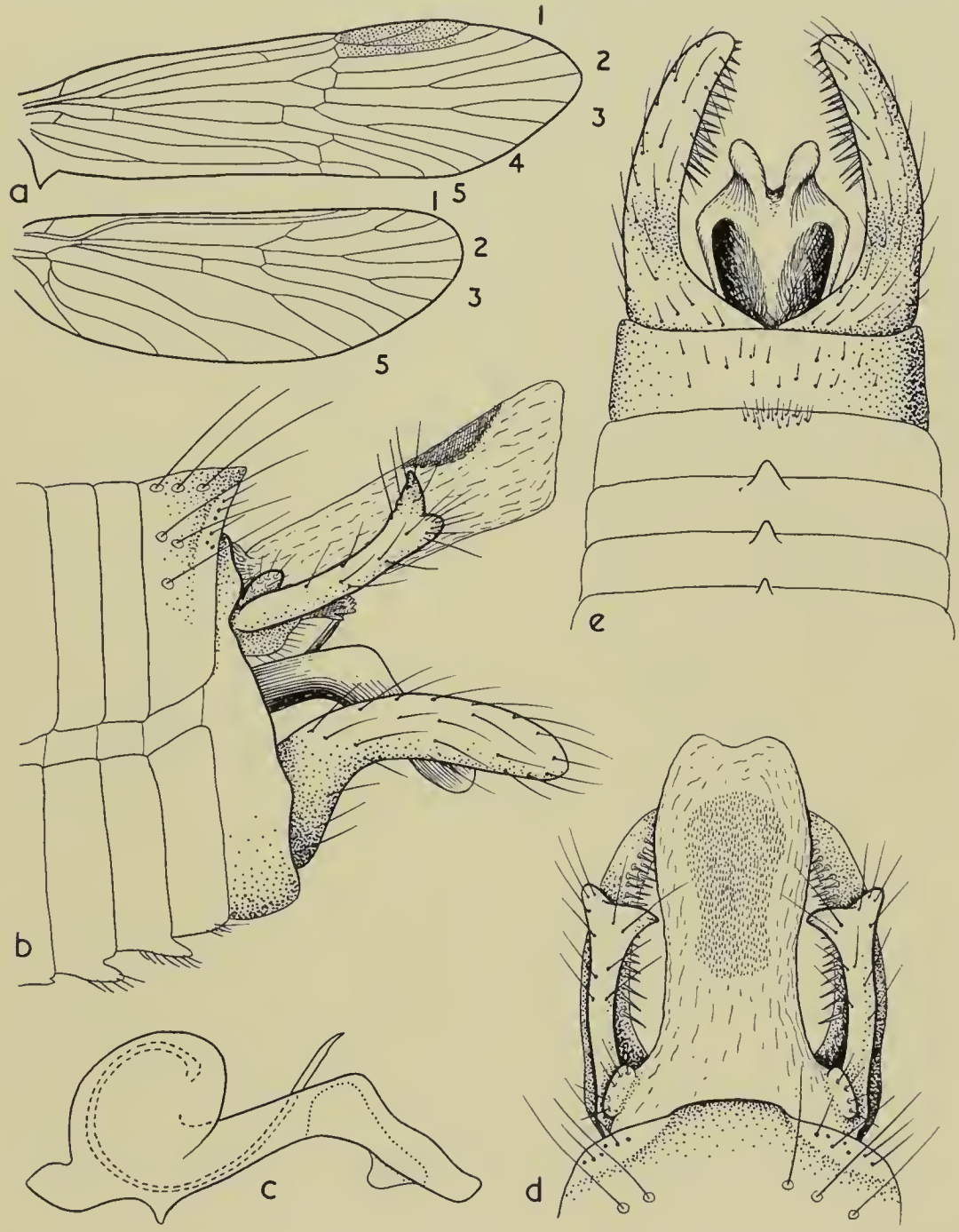

FIG. 282.—*Hydrobiosis frater* McLachlan. ♂. *a*, wings ; *b*, genitalia, lateral ; *c*, penis, etc., lateral ; *d*, genitalia, dorsal ; *e*, inferior appendages and penis, ventral.

complicated ; app. sup. long and hairy, slender at the base, dilated and notched at the apex : app. inf. long and short (stout ? M.E.M.), obtuse, curved upwards, the apex directed slightly downwards, beset with short tooth-like spines on the inner side ;

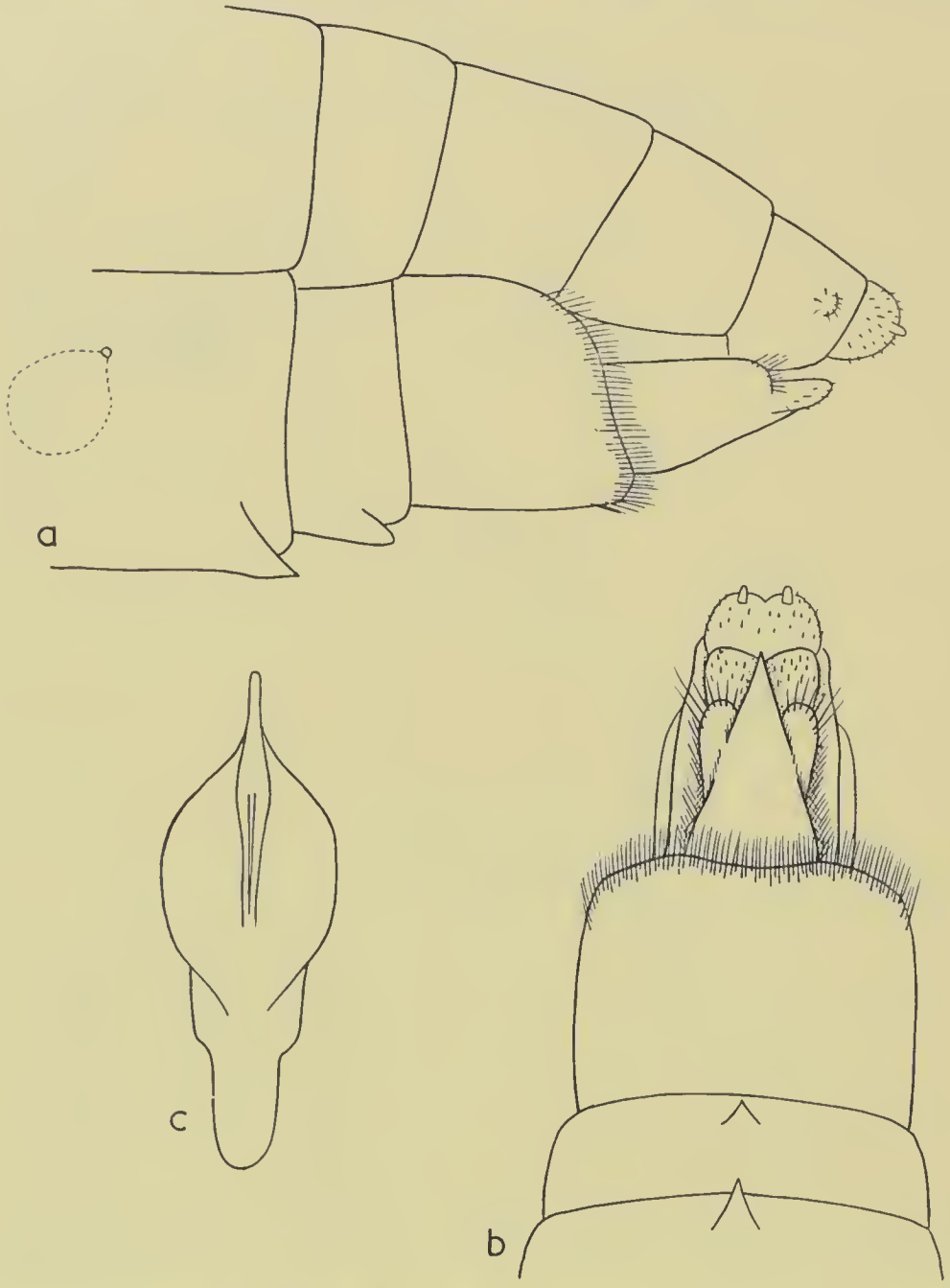

Fig. 283.—*Hydrobiosis frater* McLachlan. ♀ genitalia. *a*, lateral ; *b*, ventral ; *c*, vaginal structure, ventral (more enlarged).

penis directed abruptly downwards, very deeply divided at the apex. In the ♀ the apex of the abdomen is obtuse, the dorsal and ventral margins of the last segment forming an open pouch, in which are indistinct obtuse appendices (pl. II, fig. 9*a*)."

" Long. corp. ♂ $2\frac{1}{2}$‴, ♀ 3‴ ; exp. alar. ♂ $7\frac{3}{4}$–$8\frac{1}{2}$‴, ♀ $10\frac{1}{2}$–11‴."

" [New Zealand] Christchurch, Canterbury (*Fereday*), 6 ♂, 2 ♀."

I give here a further description of the ♂ genitalia from an example cleared in KOH.

Genitalia, ♂.—Apical margin of the eighth tergite entire, but so patterned as to give the appearance of being produced at its centre, the apical margin of the produced part being truncate. The centre of the margin of the ninth tergite produced in a large, rather narrow, rectangular plate ; apical margin slightly excised and directed tailward or slightly upward. The plate is semi-transparent, bearing a dark, elongate patch of minute spinules on the centre of its upper surface. Superior appendages long, rather more than half the length of the dorsal plate. Apices widely dilated and bifurcate, the inner forks forming inwardly directed claws. A minute process or wart on the upper surface at the base. Upper penis-cover in the form of two short processes, their margins strongly serrate, immediately beneath the base of the dorsal plate. Penis slender, directed upward. Lower penis-cover bifurcate, elbowed downward, hollowed out beneath at the elbow. Inferior appendages arched, a little longer than the superior, inner surfaces beset with a serried row of teeth. Processes to the fifth, sixth and seventh sternites.

[*Genitalia*, ♀.—Short processes to the fifth and sixth sternites ; fifth sternite also with a pair of small pores, situated one on each side towards the basal, lateral margins, connected to an internal sac. Seventh sternite large, its apical margin slightly produced and rounded, the centre slightly concave. Eighth sternite triangularly produced, with rounded, fringed lobes on each side and beyond them a pair of truncate plates. Ninth tergite with a low, hairy wart on each site. Vaginal structure as figured.—D. E. K.]

Hudson records this species from Nelson and Christchurch, and adds,

" In February, 1892, I found this insect in great abundance on the banks of the Buller River, where it flows out of Lake Rotoiti."

Type in the British Museum (N.H.).

Hydrobiosis soror sp. n. (figs. 284–286).

Insect smallish. *Anterior wing* mottled with brown and yellow, clothed with very coarse, semi-recumbent hairs, mainly yellow, but with two extensive patches of black in the post-costal region, interrupted by a rounded patch, of yellow at the arculus. *Posterior wing* pale brown, with no coarse hairs, darker towards the apex. *Head* brown. *Antennae* with the basal joints dark brown ; remaining joints yellowish, strongly annulated with brown. *Legs* with alternate patches of brown and yellow.

Genitalia, ♂.—Apical margin of the eighth tergite membranous at the centre, with a strongly chitinized edge on each side bearing a row of bristles. A rectangular, semi-transparent plate extends from the margin of the ninth tergite ; apex truncate, sides dilated and rounded at the base. Superior appendages rather more than half the length of the dorsal plate ; apices gradually but only slightly dilated, from the side ; a small wart on the segment

just above the basal attachment. Upper penis-cover, which in *frater* takes the form of a pair of short processes with serrate margins, more strongly developed in *soror* and closely fringed with very coarse bristles along the inner upper margins, the bristles at the apex bunched together and directed outward to give the appearance of a wide fork. Penis slender, directed upwards. Lower penis-cover with excised apex, elbowed slightly downwards, with a tailwardly directed, curved hook obscurely attached to the cover, the segment and, perhaps, to the upper penis-cover as well. Upper margin produced midway in a large, blunt, basally directed hook or process. About midway between these hooks and the apex, a pair of basally directed, hook-shaped wings arises from the upper lateral surface. Inferior appendages

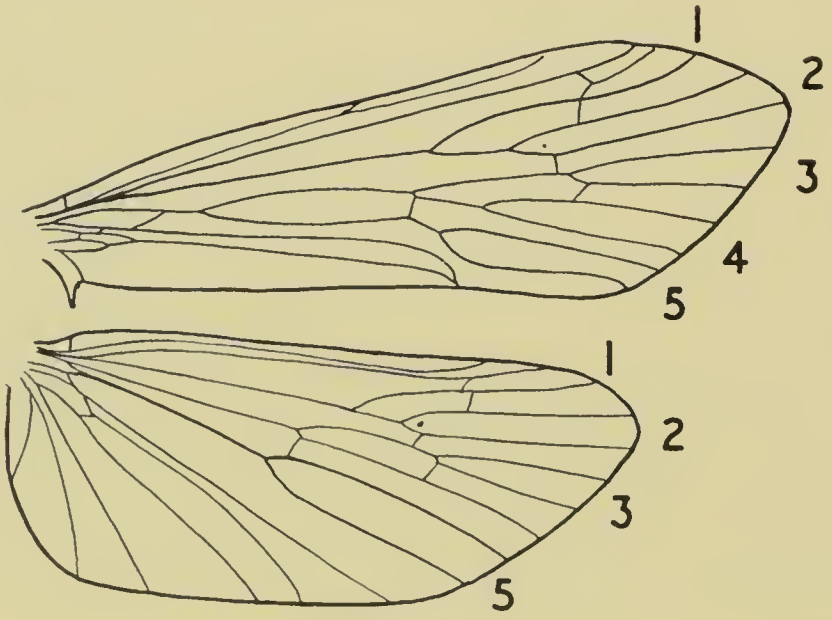

Fig. 284.—*Hydrobiosis soror* sp. n. ♂ wings.

large ; apices dilated and bearing a mat of spinules on their inner surfaces. A very small process to the seventh sternite.

Genitalia, ♀.—The processes of the genitalia are rather obscure. The seventh sternite, from the side, darkly pigmented and considerably rounded ; sixth sternite bearing a short, acute tooth ; fifth sternite with a very long, slightly sinuous process developing from lateral ridges.

Length of anterior wing, ♂, ♀, 8 mm.

New Zealand : South Karori, 12.xii.1936, 1 ♂ (*type*), 1 ♀, G. V. Hudson.

This species is evidently more closely related to *H. frater* than to *H. umbripennis* and *H. parumbripennis*, and differs in the form of the ♂ genitalia, particularly the superior appendages, and in the unusually long process to the fifth sternite in the ♀. It is closely related to *H. clavigera* McFarlane, from which it may be distinguished by the straighter inferior appendages.

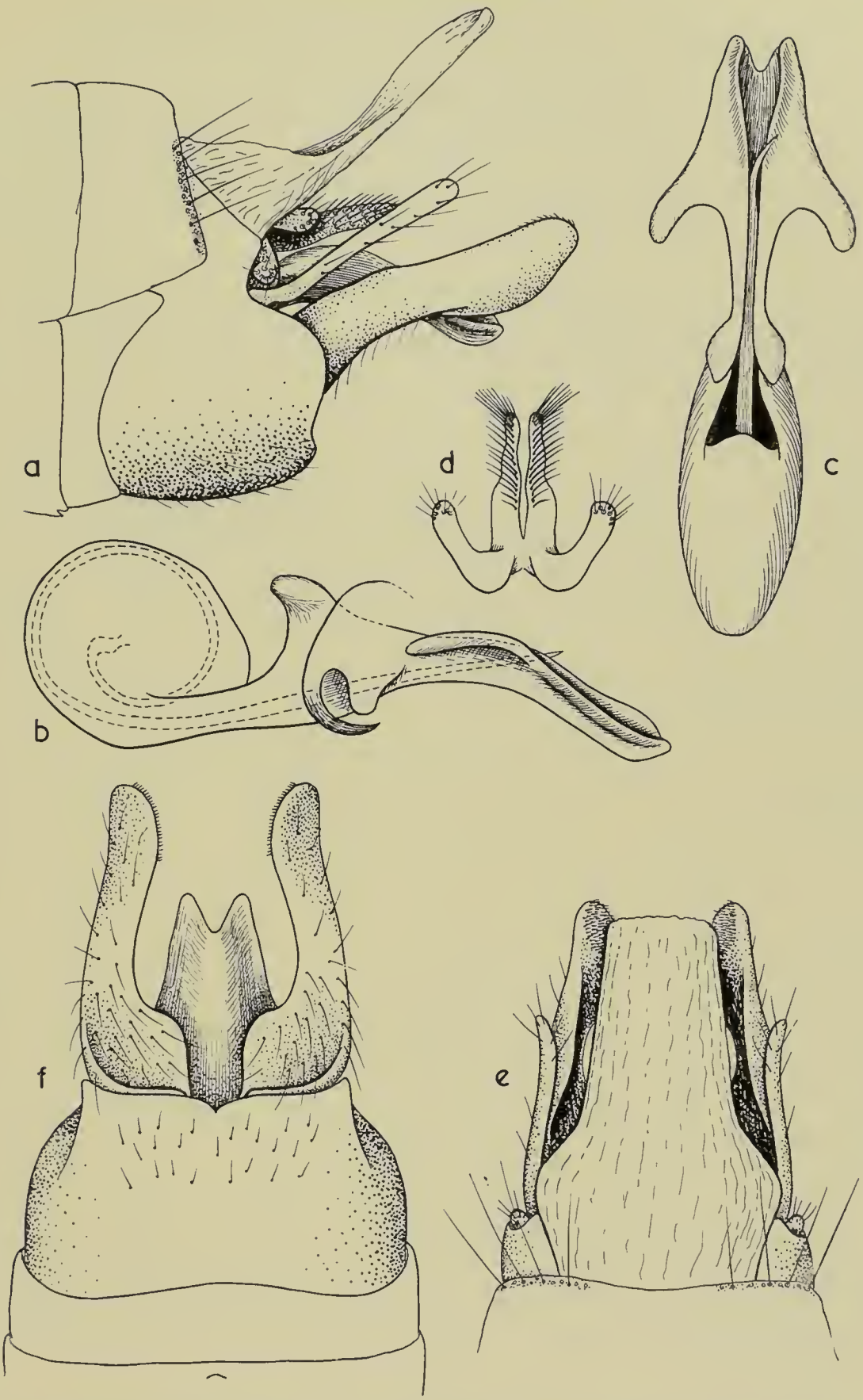

FIG. 285.—*Hydrobiosis soror* sp. n. ♂. *a*, genitalia, lateral ; *b*, penis, etc., lateral (attachment of hook obscure) ; *c*, penis, dorsal ; *d*, upper penis-cover, dorsal ; *e*, genitalia, dorsal ; *f*, inferior appendages and penis, ventral.

Hydrobiosis clavigera McFarlane.

(See Appendix, p. 536.)

Hydrobiosis charadraea McFarlane.

(See Appendix, p. 537.)

Hydrobiosis ingenua Hare.

Hydrobiosis ingenua Hare, 1909, *Trans. N. Zeal. Inst.*, 42 : 33.
Hydrobiosis ingenua Tillyard, 1924, *Trans. N. Zeal. Inst.*, 55 : 287.

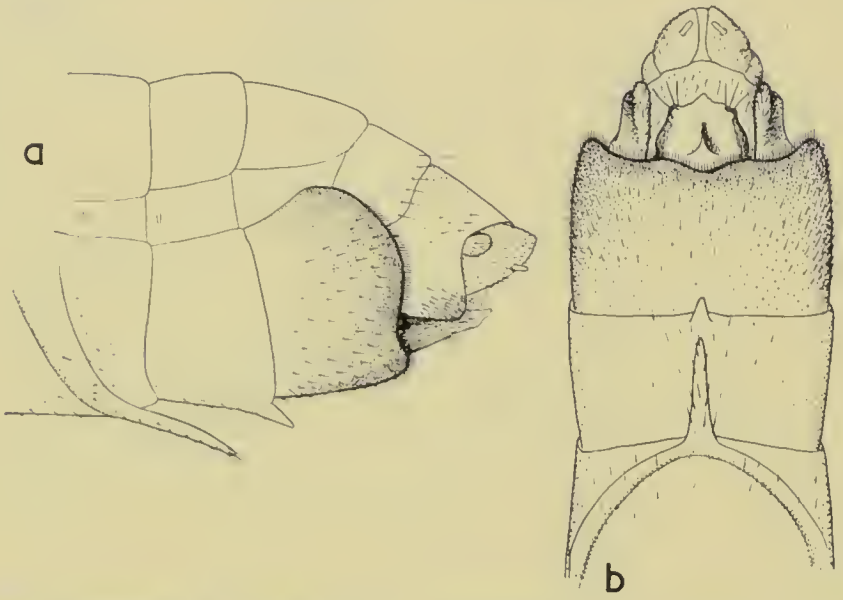

Fig. 286.—*Hydrobiosis soror* sp. n. ♀ genitalia. *a*, lateral ; *b*, ventral.

Hare describes the species as follows :

" Brownish-fuscous. Antennae as long as forewings, brown. Maxillary palpi pilose, fuscous. Ocelli dark brown, distinct. Head, prothorax and mesothorax densely clothed with brown hairs. Forewings brownish-fuscous, hairs light ; a pale-golden band before the termen and a tuft of black hairs on superior cubitus. Hindwings greyish-fuscous, strongly iridescent. Legs greyish ochreous, tibiae and tarsi marked with fuscous. Spurs brownish-ochreous."

Length of body, 6 mm. Expanse of wings, 14 mm.

New Zealand : Wellington, Wainuiomata River.

I am unable to recognize the species from the above description, which is unaccompanied by any figure. Mr. Hare informs me that his entire collection of Trichoptera has been destroyed by mites, so that the *types* of the species he has described are no longer available.

According to Tillyard, *Hydrobiosis occulta*, described in the same paper, is a *Hydropsyche*.

Psilochorema McLachlan.

Psilochorema McLachlan, 1866, *Trans. Ent. Soc. Lond.*, (3) 5 : 273.
Psilochorema Hutton, 1899, *Trans. N. Zeal. Inst.*, 31 : 247.
Psilochorema Hudson, 1904, *N. Zeal. Neur.* : 88.
Psilochorema Ulmer, 1907, *Gen. Insect.*, 60a : 203.
Psilochorema Tillyard, 1924, *Trans. N. Zeal. Inst.*, 55 : 287, text-fig. 2.

McLachlan describes the genus as follows :

"Antennae very slender, slightly longer than the wings ; basal joint thick, shorter than the head. Head broadly transverse, produced in front between the antennae, rugose, the hinder portion forming a kind of raised collar. Ocelli very distinct, round. Maxillary palpi slender, slightly hairy ; the two basal joints short and broad ; the third longer and slender ; the fourth shorter than the third ; the fifth thong-shaped, longer than the third. Labial palpi with a slender terminal joint. Mesothorax ovate, with a raised tuft of hairs in the middle, in the male. Anterior wings lying nearly flat when in repose, narrow, the margins nearly parallel ; the apex somewhat dilated, obtuse and elliptical ; hairy clothing short and dense ; on the cubital veins, in the male, are tufts of raised hairs ; before the middle of the wing there are several cell-like spaces which are entirely glabrous ; neuration of the disk irregular ; discoidal cell closed (in *P. mimicum*), with an additional smaller cell placed below it, formed by the presence of a transverse vein between the two prongs of the ramus discoidalis ; the apical veins long and parallel, forming long narrow apical cells ; apical forks 1, 2, 3, 4 and 5 all present. Posterior wings scarcely so long as the anterior and rather broader ; pubescence scanty ; fringes moderate ; neuration irregular ; forks 1, 2, 3 and 5 present. Legs moderately long, alike in both sexes. Spurs 2-4-4. Abdomen moderately robust."

" This singular genus differs from anything with which I am acquainted, especially in the abnormal arrangement of the neuration and in the position of the wings in repose ; in this latter condition the single species known to me bears a striking resemblance to a Micro-Lepidopterous insect of the genus *Depressaria*."

To this it may be added that there is a strong process to the sixth sternite and a pair of peculiarly formed, lateral filaments arising at the base of the fifth. In the posterior wing, Cu_2 and 1A are confluent before the wing margin, thus enclosing an elongate, acute-ended cell.

Type species.—*Psilochorema mimicum* McLachlan, 1866.

Key to Species of *Psilochorema*, Males.

1. Inferior appendages very large, from side concealing most of genitalia . . . . . *P. mimicum* McLachlan (p. 426).
–. Inferior appendages not concealing most of genitalia . . . . . 2.
2. Inferior appendage shorter than dorsal plate, without a dorsal process on upper margin at base . . . . . *P. nemorale* McFarlane (p. 428).
–. Inferior appendage as long as dorsal plate, with a dorsal process on upper margin at base . . . . . 3.
3. Dorsal process blunt at apex in side view . . . *P. leptoharpax* McFarlane* (p. 539).
–. Dorsal process hammer-headed, apices acute . . . . . 4.
4. Inferior appendage short and broad from side . . *P. bidens* McFarlane* (p. 540).
–. Inferior appendage elongate and narrow . . *P. macroharpax* McFarlane (p. 430).

* See Appendix.

Psilochorema mimicum McLachlan (figs. 287, 288).

Psilochorema mimicum McLachlan, 1866, *Trans. ent. Soc. Lond.* (3) 5 : 274, pl. 18, fig. 4.
Psilochorema mimicum McLachlan, 1868, *Journ. Linn. Soc. Lond. Zool.*, 10 : 213.
Psilochorema mimicum McLachlan, 1873, *Ann. Mag. n.H.* (4) 12 : 41.
Psilochorema mimicum Hutton, 1899, *Trans. N. Zeal. Inst.*, 31 : 247.
Psilochorema mimicum Hudson, 1904, *N. Zeal. Neur.* : 88.
Psilochorema mimicum Ulmer, 1907, *Gen. Insect.*, 60a : 204, pl. 27, figs. 245–6.

McLachlan describes the species as follows :

"Antennae fuscous, annulated with yellow, the apical portion wholly fuscous. Head and mesothorax dark chestnut-brown. Palpi brown. Metathorax polished chestnut-brown. Anterior wings smoky-fuscous, with pale golden and whitish markings, most plentiful on the dorsal half; a whitish indentated fascia a little before the apex ; several raised tufts of blackish hair along the dorsal margin towards the base. Posterior wings greyish-hyaline. Legs greyish-ochreous, the tips of the tarsal joints annulated with pale yellowish. Abdomen blackish-fuscous, the appendices testaceous. In the male the superior appendices are very small, slender at the base and clavate at the apex, hairy ; inferior appendices very large and broad, concave, and furnished with numerous minute blackish teeth internally, the outer margin broadly emarginate ; between the app. inf., on the superior portion, arises a long flattened and obtuse piece, which I regard as the upper penis-cover."

" Long. corp. 3 lin. ; exp. alar. 7½ lin."

" New Zealand."

To McLachlan's description of the species I add a further account of the genitalia, made from one of the co-types cleared in KOH :

Genitalia, ♂.—Ninth segment very lightly chitinized above, projecting somewhat below. The centre of its apical margin is produced in a narrow, hood-shaped dorsal plate, on each side of which is a slender superior appendage with dilated apex ; one of these is broken away in the type. At the base of the appendage, either attached to it or to the dorsal plate, is a small rounded wart. Immediately below the dorsal plate is a pair of short, spine-like processes with serrate apices, possibly the upper penis-cover. Penis perhaps merged with the lower penis-cover, apex excised, with a pair of large, lateral, rounded plates midway, a fine duct curling upward near the middle. Inferior appendages huge, obscuring most of the genitalia from the side, including even the base of the dorsal plate. Upper margin with a wide, obtuse excision : entire inner margin fringed with a serried row of short, peg-like teeth, which also form a group extending inward at the angle of the excision. A long process to the sixth sternite and a pair of strongly chitinized, black filaments arising from the basal margin of the fifth, their apices produced in a fine thread.

Genitalia, ♀.—Apical margin of the eighth dorsal segment roundly excised, ninth bluntly triangular. From the side there is a broad plate towards the apex, with a sinuous apical margin. Seventh sternite triangularly produced. A strong process to the sixth and short lateral filaments arising from the latero-basal margin of the fifth segment as in the ♂.

Length of the anterior wing, ♂, 8 mm., ♀, 9 mm.

The example from which the figures have been drawn has one pair of wings mounted between celluloid and the abdomen in balsam and forms part

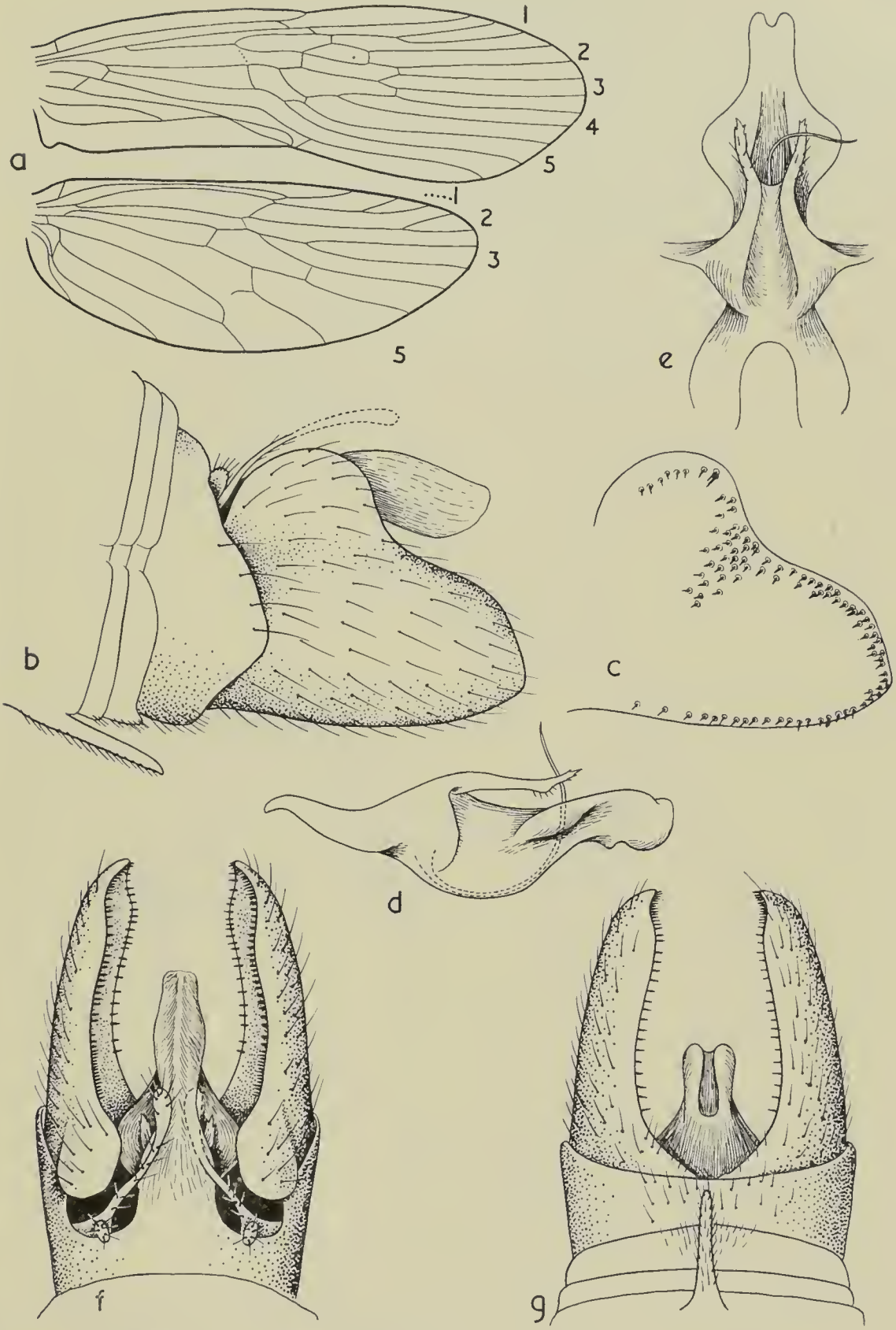

FIG. 287.—*Psilochorema mimicum* McLachlan. ♂. *a*, wings; *b*, genitalia, lateral; *c*, right inferior appendage from within; *b*, penis, etc., lateral; *e*, penis, etc., dorsal; *f*, genitalia, dorsal; *g*, inferior appendage and penis, ventral.

of the type series in the British Museum (N.H.). I designate it as the *type* of the species.

Hudson says,

"The transformations of this species appear to closely resemble those of *H. umbripennis*.

"The perfect insect appears about midsummer, and is often attracted by light, but single individuals are occasionally seen at all times in the year."

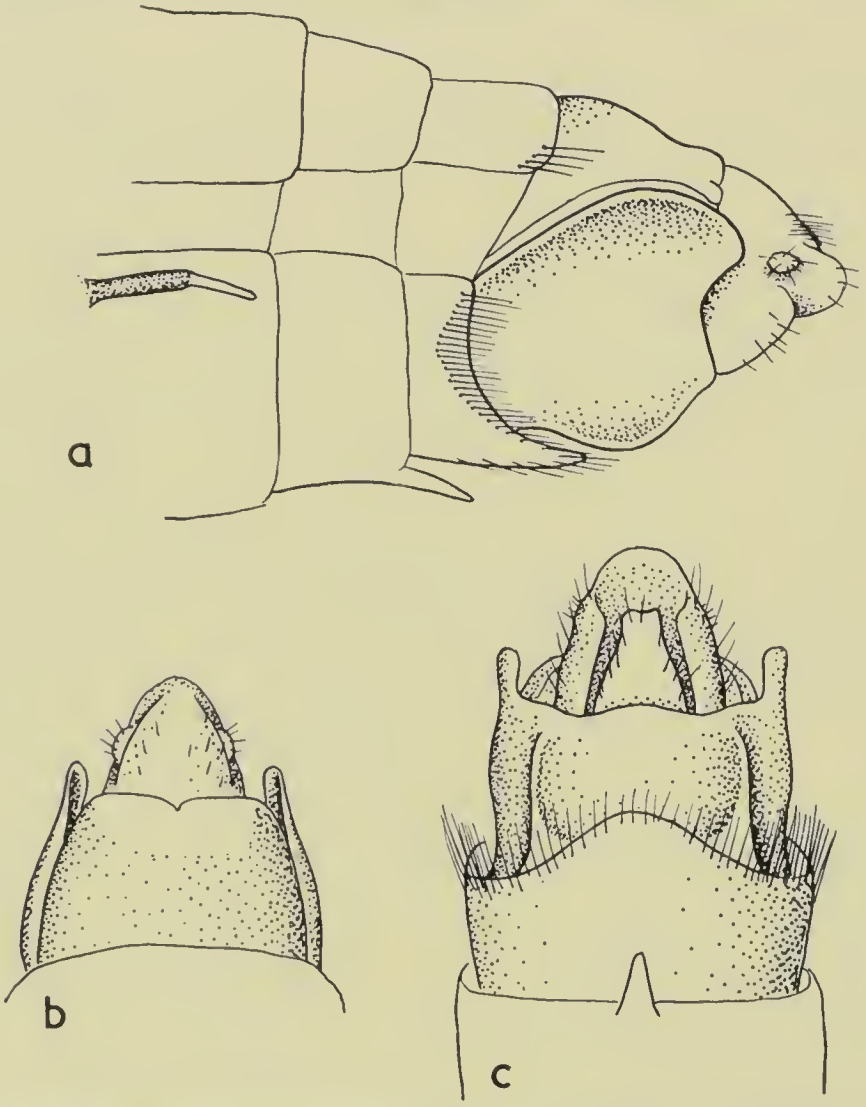

FIG. 288.—*Psilochorema mimicum* McLachlan. ♀ genitalia. *a*, lateral; *b*, dorsal; *c*, ventral.

Psilochorema nemorale McFarlane (fig. 289).

Psilochorema nemorale McFarlane, 1951, *Rec. Canterbury Mus.*, 5 : 262, pl. 61, figs. 27, 28.

Head black; oculi very deep brown. *Antenna* with the basal joint large, with blackish and white hairs intermixed, remaining joints ochraceous with brown annulations. *Wings* with the membrane slightly pinkish, with numerous

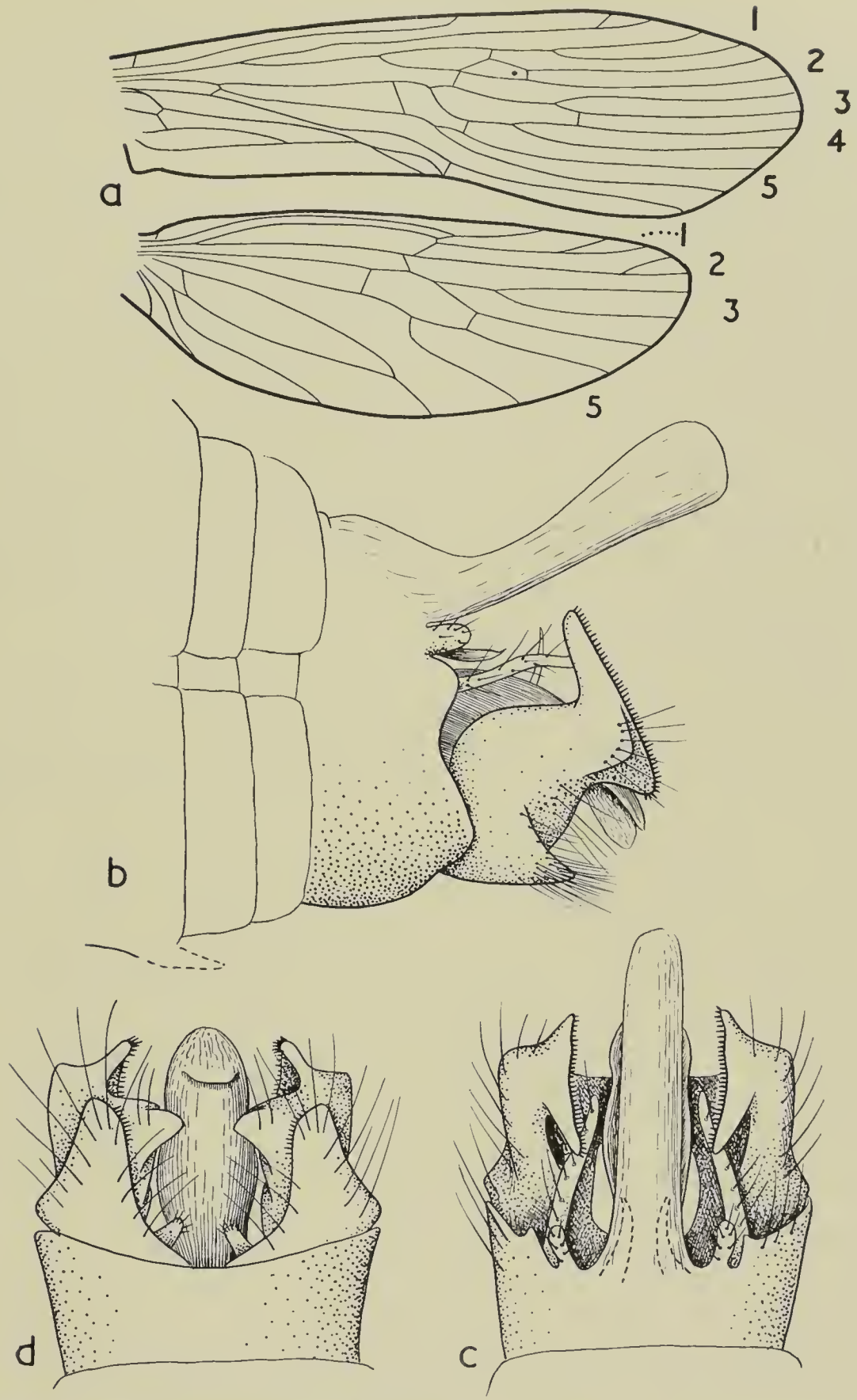

FIG. 289.—*Psilochorema nemorale* McFarlane. ♂. *a*, wings; *b*, genitalia, lateral; *c*, dorsal; *d*, ventral (dorsal plate omitted).

clusters of erect black hairs and a few white streaks. *Neuration* normal. Legs reddish-brown, with here and there yellow patches, particularly at the apices of the tarsal joints.

Genitalia, ♂.—The centre of the apical margin of the ninth dorsal segment produced in a narrow, elongate, membranous plate, directed slightly upward, and with a dilated apex as seen from the side: there is a pair of small processes arising from the margin of the segment at the base of the plate, one on each side. Superior appendages long and slender. Beneath the dorsal plate, but only visible in a cleared example, is a pair of very stout spines, apices slightly divergent, probably an upper penis-cover. Penis large and stout, arching downward, and with a slender duct arising from towards its base and emerging from the middle of its dorsal surface. Inferior appendages large, divided in several parts. From above, two upper branches are seen, with wide apices set with comb-like black teeth, and directed towards each other. From beneath, these are seen to form an upper portion with various projecting angles. The lower parts are wide, narrowing to rounded apices, inner margins there set with black teeth. Two small finger-like processes arise at the base, directed inwards. From the side there is a projecting angle on the lower surface of the appendage at the base. A single ventral process to the sixth segment. Lateral filaments as in *macroharpax* McFarlane.

Length of anterior wing, ♂, 8 mm.

New Zealand: Wilton's Bush, 2.iii.1933, G. V. Hudson, Hawdon River, Arthur's Pass National Park (McFarlane).

Type, ♂, in the Canterbury Museum. This species differs from *P. mimicum* in the smaller and more complicated inferior appendages. It occurs in small slow streams at the margin of beech forest between 2000 and 2500 ft. (McFarlane).

Psilochorema macroharpax McFarlane (fig. 290).

Psilochorema macroharpax McFarlane, 1951, *Rec. Canterbury Mus.*, 5 : 263, pl. 61, figs. 31, 32.

Head dark ochraceous. *Legs* ochraceous, a little paler at the apices of the tarsal joints. *Wings* ochraceous, much denuded but with remnants of a clothing of brownish hairs and patches of short, golden hairs.

Genitalia, ♂.—Apical margin of the ninth tergite produced in a long, narrow, membranous plate, directed upward from the side, and with a truncate apex: on each side, at the base, is a minute wart. Superior appendages long and slender, apices slightly dilated. Beneath the base of the membranous plate is a pair of short, hooked processes forming an upper penis-cover. Penis large, arching downward, with a slender duct arising from the centre of its upper surface, and with an angular projection on each lateral angle before the apex. Inferior appendages branched, upper branch arising at the base, directed upward, with an extended and flattened apex set with small, black, comb-like teeth. The main branch is considerably produced, apex rounded: inner margin of the apex, and also the lower margin, set with small, fairly evenly-spaced teeth. A strong process to the sixth sternite and a pair of

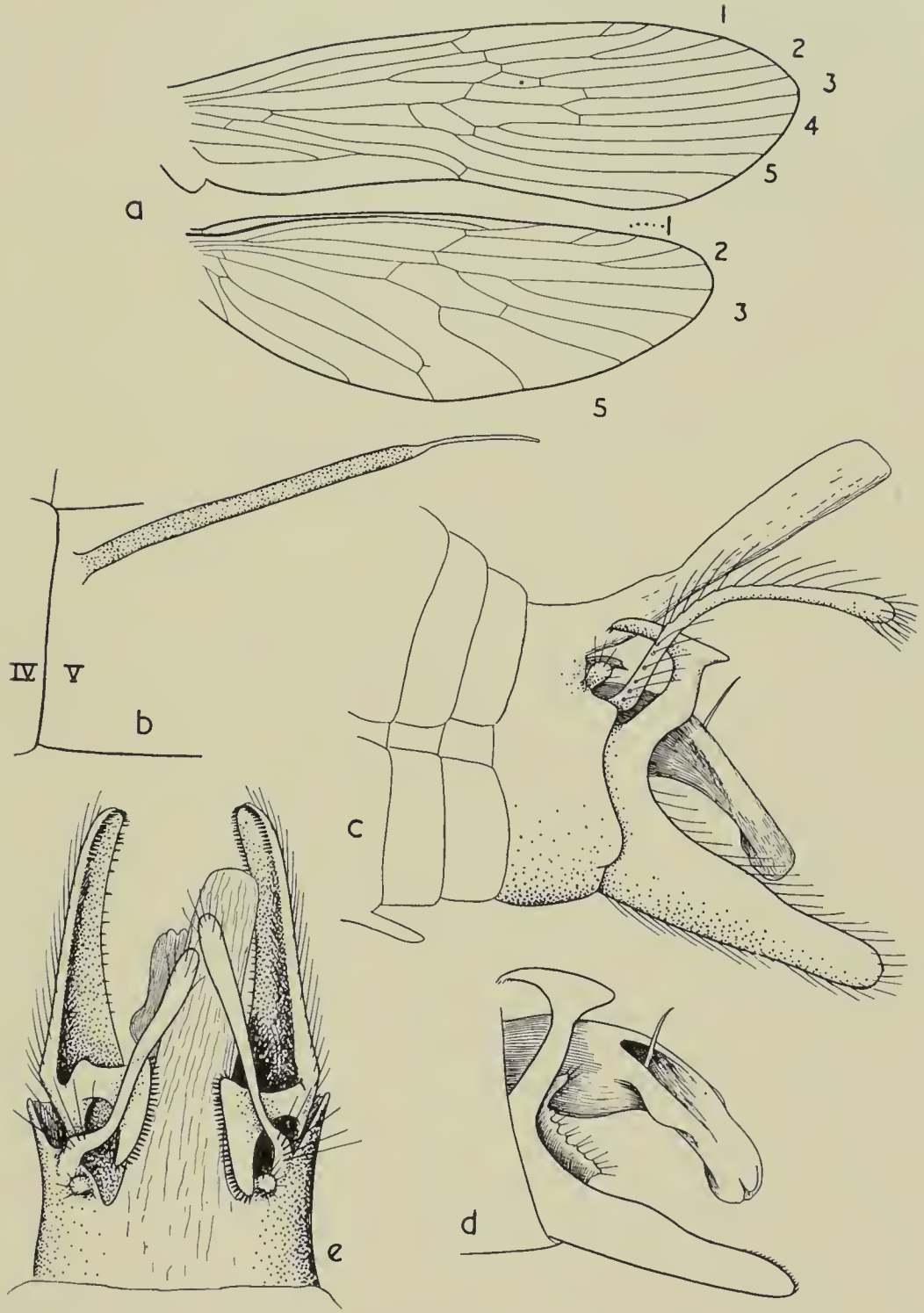

FIG. 290.—*Psilochorema macroharpax* McFarlane. ♂. *a*, wings; *b*, filament of fifth abdominal segment; *c*, genitalia, lateral; *d*, inferior appendage and penis from side and somewhat behind; *e*, genitalia, dorsal.

slender and very strongly-chitinized lateral filaments at the base of the fifth sternite, apices produced in slender threads.

Length of anterior wing, ♂, 9 mm.

New Zealand : N. Island, Ohakune, 20.iii.1922, T. R. Harris ; Wellington Wilton's Bush, iv.1912, G. V. Hudson ; Nelson, 11.ii.1920, A. Philpott ; Waimakiriri River catchment area, 2000-2500 ft.: Pecl Forest ; Hapuku, Kaikoura (McFarlane).

Type and paratypes, ♂, in the Canterbury Museum. The larvae live in small, cold streams not open to the sun, as in deep gullies (McFarlane).

Psilochorema bidens McFarlane.

(See Appendix, p. 540.)

Psilochorema leptoharpax McFarlane.

(See Appendix, p. 539.)

Ulmerochorema gen. n.

Notiobiosis Banks, 1939. *Bull. Mus. comp. Zool., Harv.*, 85 : 499 (*partim*).

Spurs 2, 4, 4. *Anterior wing* with discoidal cell closed, elongate ; median cell closed, small, apical cross-vein oblique ; apical forks nos. 1, 2 and 4 sessile, 3 and 5 stalked. *Posterior wing* with discoidal cell open. Apical forks nos. 1, 2, 3 and 5 present, all with footstalks. *Abdomen* of female with ventral processes on the sixth and seventh segments.

Type species.—*Hydrobiosis stigma* Ulmer, 1916.

This genus has been erected to take the species *stigma* from Queensland, which Ulmer placed with some doubt in the genus *Hydrobiosis* McLachlan, and which Banks has more recently transferred to his genus *Notiobiosis*. On the characters given by Ulmer, it differs from both these genera in possessing a closed median cell, and from *Hydrobiosis* in the sessile apical fork no. 2 in the anterior wing. From *Notiobiosis* it may also be separated by the long footstalk to fork no. 2 in the posterior wing. The presence of a closed median cell suggests the genus *Psilochorema* McLachlan, but from that genus it differs in having a long footstalk to fork no. 3 in the anterior wing, and in having Cu_2 and 1A in the posterior wing free at their apices, not fused and forming a closed cell as in *Psilochorema*.

It is with considerable reluctance that I propose this new generic name for a species based on a single female example, which is known to me only from literature. There is, of course, the possibility that Ulmer's type may have been a pathological specimen. If the closed median cell in the anterior wing were indeed an aberration, then one might perhaps overlook the difference in fork no. 2 in the posterior wing and accept Banks' placing. In the absence of evidence to the contrary, it seems better to assume that the specimen was normal, and therefore there is no alternative to the erection of a new genus.

Ulmerochorema stigma (Ulmer) (fig. 291).

Hydrobiosis stigma Ulmer, 1916, *Ark. f. Zool.*, **10** : 2, figs. 1, 2.
Hydrobiosis stigma Tillyard, 1924, *Trans. N. Zeal. Inst.*, **55** : 287.
Notiobiosis stigma Banks, 1939, *Bull. Mus. comp. Zool. Harv.*, **85** : 499.

The following is a free translation of Ulmer's description :

The material is preserved in alcohol. *Head* and *thorax* above brownish black, *abdomen* somewhat paler. *Antenna* almost as long as the anterior wing,

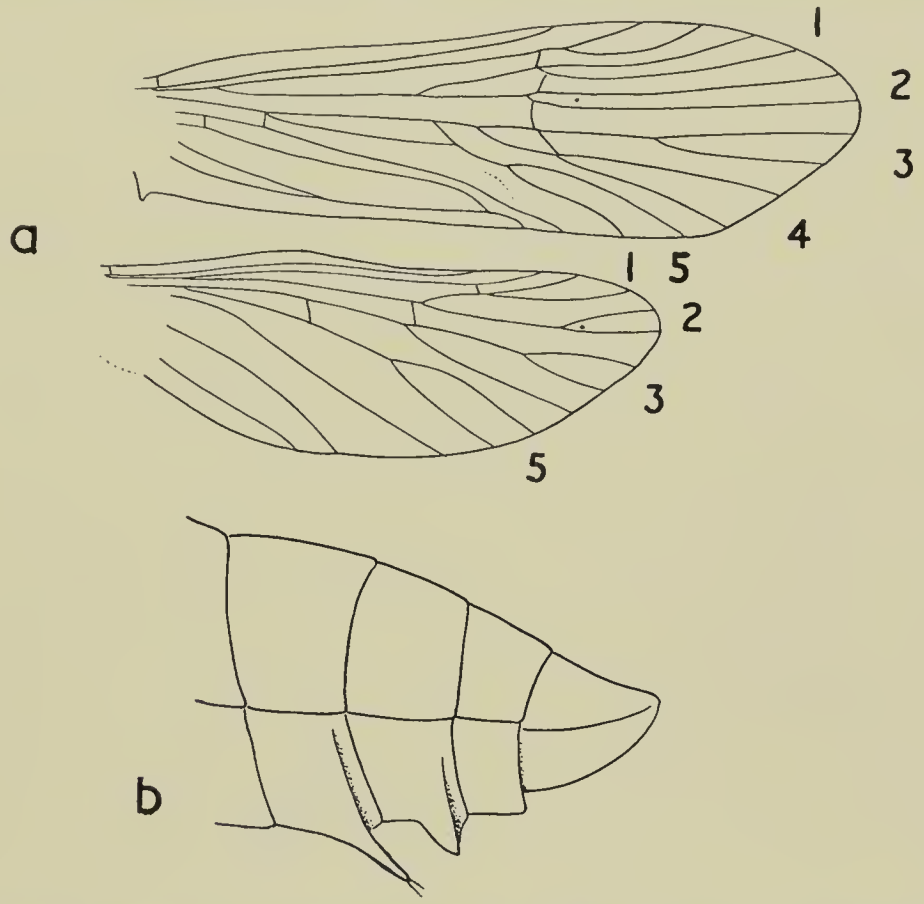

Fig. 291.—*Ulmerochorema stigma* (Ulmer). ♀ (after Ulmer). *a*, wings ; *b*, apex of abdomen, lateral.

slender, dark brown, in the basal third annulated with light brownish yellow, towards the apex on the whole more blackish brown. Ocelli obvious. *Maxillary palpi* dark brown : first joint very short ; second twice as long ; third even longer ; fourth almost as long as third ; fifth the longest, about one and a half times as long as fourth. Labial palpi dark brown, the third joint the longest. *Legs* dark brown, the base of each tarsal joint annulated with yellow. *Anterior wing* with grey-brown membrane, which is not densely pubescent, so that the dark brown neuration is clearly visible. The veins dotted in the figure are hyaline. Pubescence brown and black, the pterostigma more heavily pubescent. *Posterior wing* with grey membrane, transparent,

iridescent, with very scattered brownish hairs, which are denser only in the region of the branches of the radial sector and near the margins. Veins and marginal fringes dark brown. In the anterior wing fork no. 3 has a long footstalk; in the posterior wing fork no. 1 is very long, no. 2 the shortest and no. 3 somewhat longer. *Abdomen* with processes to the hind-margins of the sixth and seventh sternites, that on the sixth larger than on the seventh.

Length of body, 6 mm.; anterior wing, 9 mm.; expanse, about 19 mm.

AUSTRALIA: Queensland: Evelyne, Mjöberg. 1 ♀.

Type in the Stockholm Museum.

Taschorema Mosely.

Taschorema Mosely, 1936, *Proc. zool. Soc. Lond.*, **1936**: 422.

Spurs 2, 4, 4. *Maxillary palpi* in the ♂ rather difficult to make out, but it may be said that the terminal joints are long and slender. Ocelli present. *Antennae* rather slender, of about the length of the *anterior wing*, which is long and narrow; apex acute. Pterostigma not very strongly defined in the type species; radius forked at its apex. Forks nos. 1, 2, 3, 4 and 5 present; discoidal cell long and narrow. In the *posterior wing*, discoidal cell open. Forks nos. 1, 2, 3 and 5 present, nos. 1, 3 and 5 with footstalks. A narrow, cell-like structure, lined with fine hairs, situated between Cu_2 and the first anal vein in the ♂, absent in the ♀, and no doubt forming part of some kind of scent-organ. In certain of the species androconia of the battledore type are present on the second and third anal veins of the posterior wing and in the post-costal area of the anterior. Filaments present or absent on the fifth abdominal sternites, varying in form according to the species.

Type species.—*Taschorema asmana* Mosely, 1936.

KEY TO SPECIES OF *Taschorema*, MALES.

1. Ventral process of seventh sternite very long, much longer than that of sixth . 2.
–. Ventral process of seventh sternite not longer than that of sixth . . . . 3.
2. Discoidal cell of anterior wing elongate, about seven times as long as broad, overlapping about three-quarters of the length of the thyridial cell *T. asmana* Mosely (p. 434).
–. Discoidal cell shorter, about five times as long as broad, overlapping about half the length of the thyridial cell . . . . *T. nigra* sp. n. (p. 436).
3. No lateral filaments on the fifth sternite . . . *T. brunnea* sp. n. (p. 436).
–. Lateral filaments present on the fifth sternite . . . . . 4.
4. Inferior appendage from side strongly dilating from base to an excised apex; superior appendage longer than dorsal plate . . . *T. evansi* sp. n. (p. 440).
–. Inferior appendage curving upward, more or less parallel-sided, apex rounded; superior appendage not longer than dorsal plate . *T. ochracea* sp. n. (p. 440).

Taschorema asmana Mosely (figs. 292, 293).

Taschorema asmana Mosely, 1936, *Proc. Zool. Soc. Lond.*, **1936**: 422, figs. 69–72.

Head dark fuscous, clothed with golden-brown hairs. Oculi black. *Antennae*, basal joint dark fuscous; remaining joints fuscous, annulated with ochraceous. *Palpi* dark fuscous. Legs ochraceous. *Anterior wing* chestnut-

brown, with a mixture of long, recumbent, black and cream-coloured hairs. Fork no. 1 sessile; nervures strong. Other characters as in the generic description.

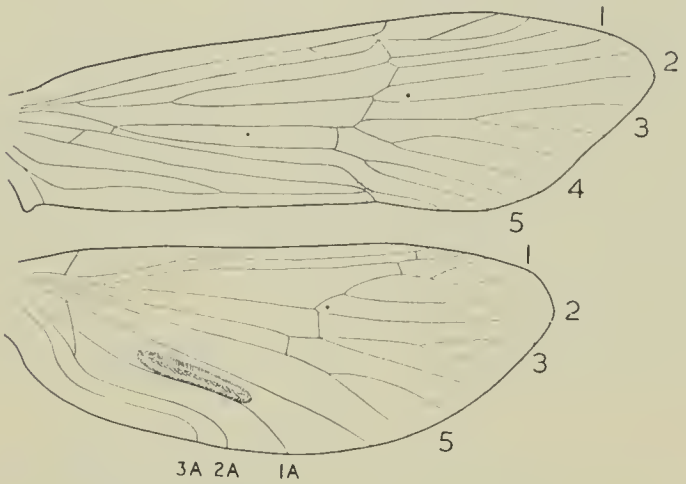

Fig. 292.—*Taschorema asmana* Mosely. ♂ wings.

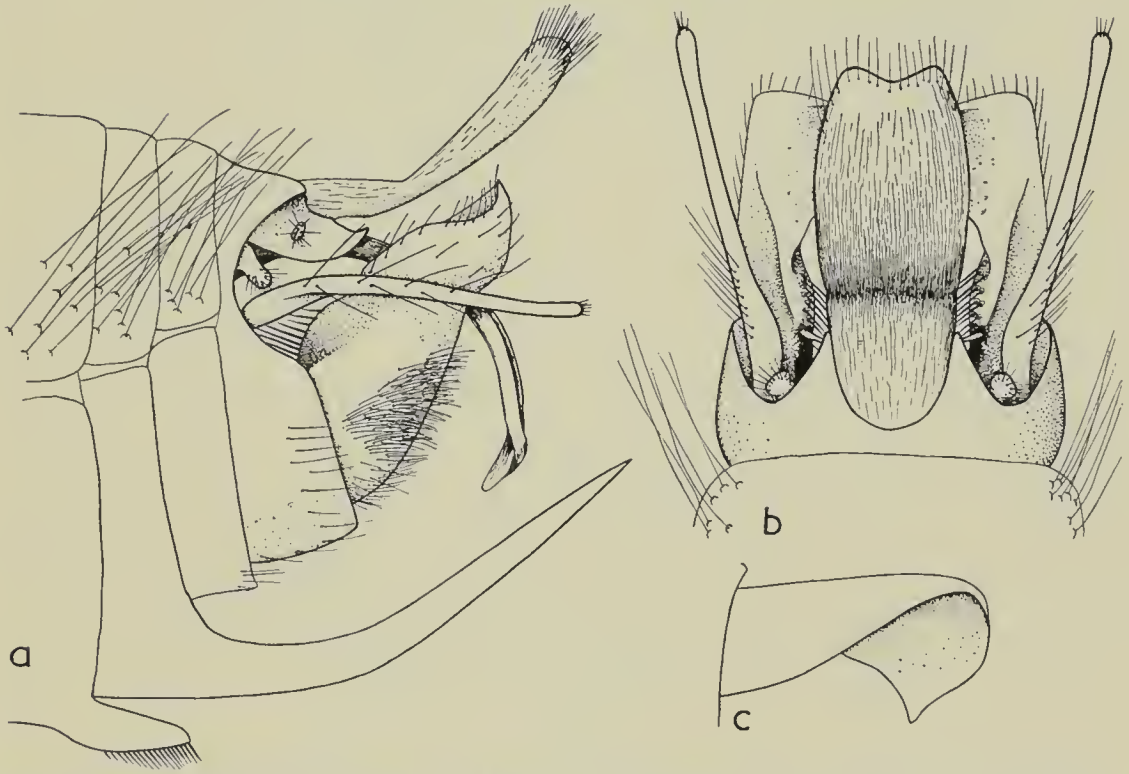

Fig. 293.—*Taschorema asmana* Mosely. ♂ genitalia. *a*, lateral; *b*, dorsal; *c*, ventral.

Genitalia, ♂.—Ninth tergite somewhat produced, its apical margin produced at its centre in a large, membranous dorsal plate, which is bent at right angles when dry (flattening-out in KOH), so that the apical half is directed upwards,

Apical margin slightly excised. Superior appendages long and slender, with a small rounded wart at their bases. Upper penis-cover forming a pair of plates, one on each side of the penis, apices pointed and upcurved. Each plate carries a small, slender-stemmed wart. Penis in the form of a pair of flat, wide, down-curving blades, the apices of which, in the type, are rounded and crossing. Inferior appendages broad, both from above and from the side. From above, they form hood-like plates ; inner angles triangular, with acute apices ; inner margins bearing long, coarse spines directed toward the base. From the side they are broad at the base, narrowing slightly to obliquely truncate apices. Seventh sternite carries a very long, stout process extending beyond the apex of the penis, and on the sixth is a short spur, with the lower margin bearing a tuft of stout spines.

Length of anterior wing, ♂, 12 mm.

TASMANIA : Great Lake, Miena, i.1931, C. Parker ; North Esk, 21.i.1933, R. J. Tillyard.

Taschorema nigra sp. n. (fig. 294).

Insect dark. *Anterior wing* narrow, apex acute ; in the ♂ clothed with a mass of short, erect and slightly curved hairs, normal hairs in the ♀. Discoidal cell shorter than in the Tasmanian species *asmana*. Fork no. 1 sessile. There are three conspicuous, hyaline marks, visible on the denuded membrane as shown in the figure. In the *posterior wing*, ♂, there is a rather long fold or cell in the neighbourhood of 1A, heavily fringed with long, silky, dark brown hairs ; in other respects the neuration is much as in *asmana*.

Genitalia, ♂.—Apical margin of the ninth tergite produced at its centre in a membranous plate, acute at its apex. Superior appendages black, very slender, almost thread-like and scarcely dilated towards their apices. Upper penis-cover formed of two pairs of branched processes, their upper branches hairy, visible on each side of the dorsal plate, lower branches spine-like. Penis, from beneath, broad and spatulate, slightly arched from the side. Inferior appendages long and broad, abruptly but only slightly narrowed to rounded apices ; lower part concave, apical part flattened and incurved so that the apices cross. Centre of the apical margin of the ninth sternite produced in a long, broad plate with widely-excised apex, and with a rounded keel on the upper side at each apical angle. A very large, long process to the seventh sternite, apex extending beyond the ninth. A shorter process to the sixth, bearing a series of long teeth on its under surface towards the apex.

Length of anterior wing, ♂, 10 mm.; ♀, 11 mm.

AUSTRALIA : Queensland, National Park, 3000 ft., 21.xii.1921, 1 ♂ (*type*), 5, 11.iii.1921, 1♂, 1 ♀.

The species appears to have some affinity to Banks' *Notiobiosis nigrita*. It differs from *T. asmana* in the relatively shorter discoidal cell and in the form of the ♂ genitalia.

Taschorema brunnea sp. n. (figs. 295,296).

Insect of medium size. General appearance yellowish brown. *Head* ochraceous ; oculi black. *Antennae* mostly wanting in the *type* but basal joint

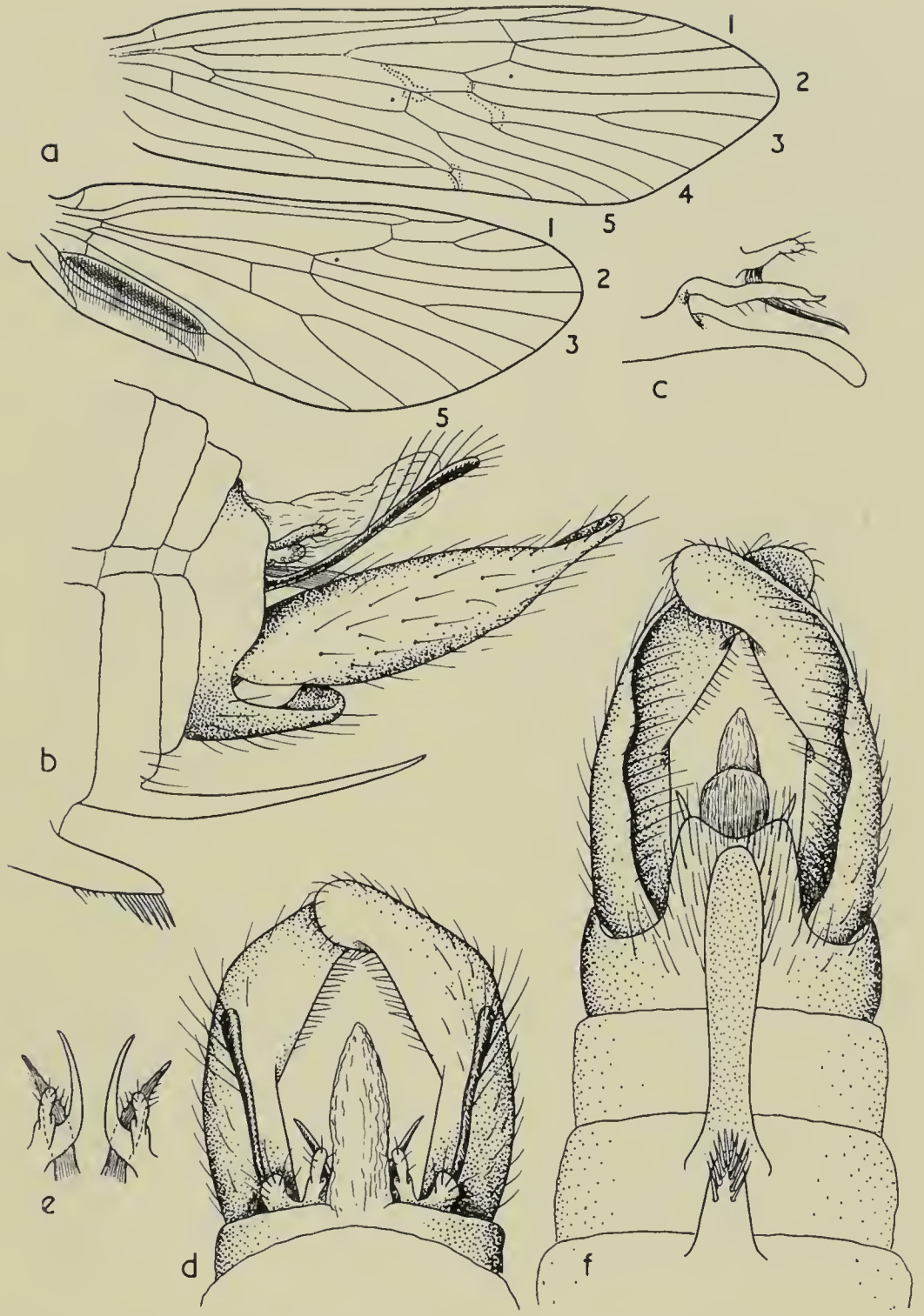

FIG. 294.—*Taschorema nigra* sp. n. ♂. *a*, wings; *b*, genitalia, lateral; *c*, upper penis-cover, lateral; *d*, genitalia, dorsal, penis and ventral plate omitted; *e*, upper penis-cover, dorsal; *f*, genitalia, ventral.

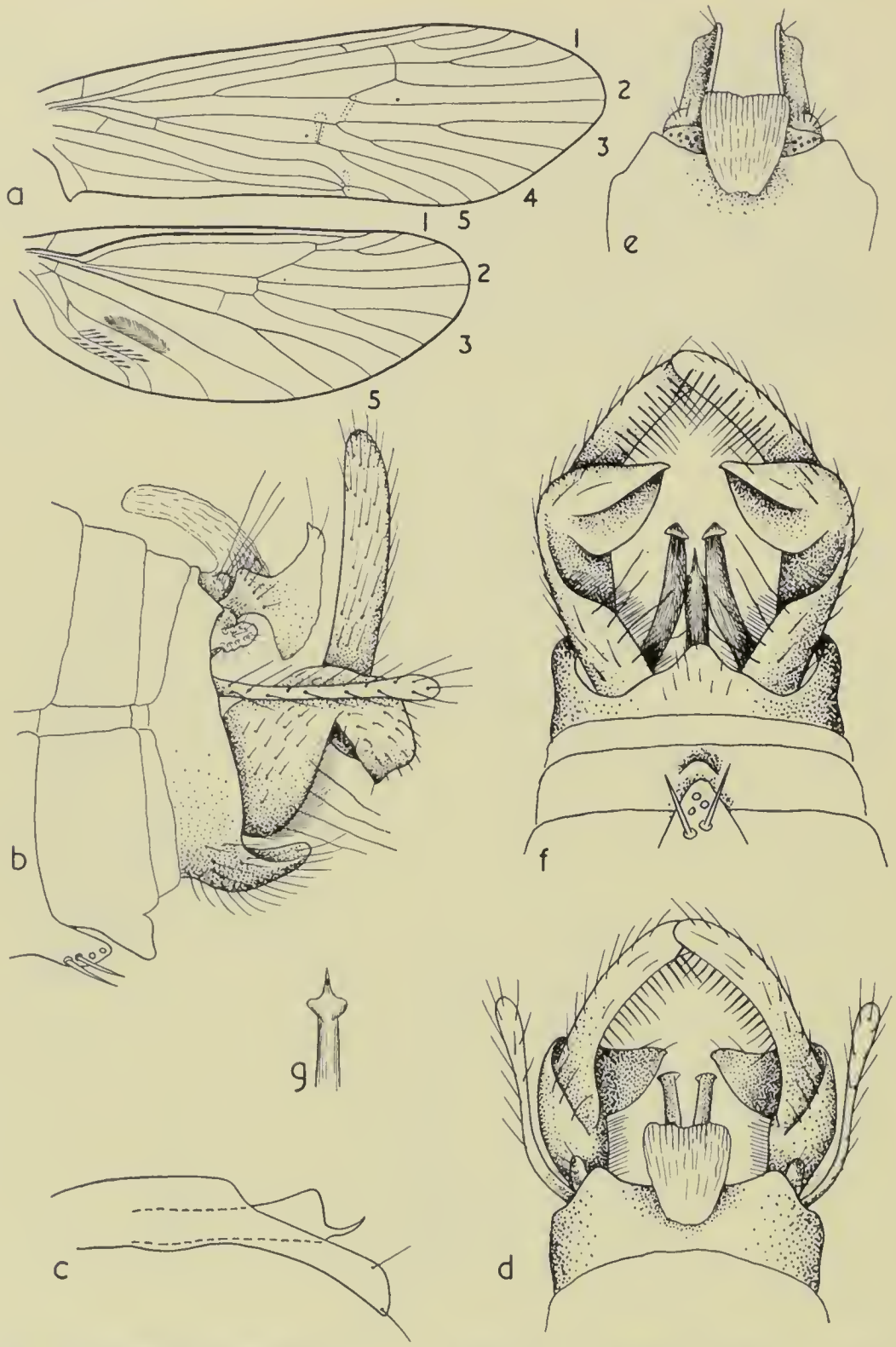

FIG. 295.—*Taschorema brunnea* sp. n. ♂. *a*, wings; *b*, genitalia, lateral; *c*, penis and sheaths, lateral; *d*, genitalia, dorsal (upper penis-cover omitted); *e*, dorsal plate and upper penis-cover, dorsal; *f*, genitalia, ventral; *g*, apex of penis, ventral.

of the same colour as the head ; remaining joints paler. *Palpi* and *legs* ochraceous. *Wings*, *anterior* brownish, sparsely clothed with fuscous and black hairs, of which there are two conspicuous tufts along the post-costa towards the base of the wing. Nervures mottled with ochraceous and pale cream colour. In the *anterior wing* fork no. 1 has a long footstalk in the ♂, sessile in the ♀. *Posterior wing* with a pale-coloured, elongate ring of short hairs between Cu_2 and 1A, and a row of battledore androconia on 2A and 3A.

Genitalia, ♂.—Apical margin of the ninth tergite produced at its centre in a membranous plate directed upwards ; when straightened, the plate is seen to

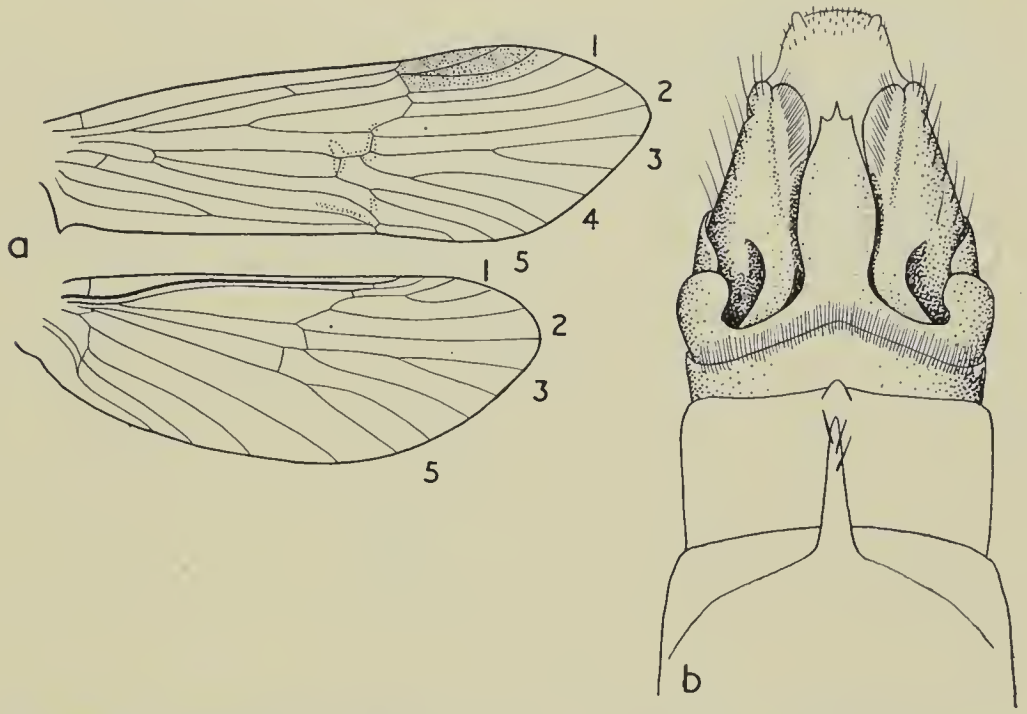

Fig. 296.—*Taschorema brunnea* sp. n. ♀. *a*, wings ; *b*, genitalia, ventral.

be broad at the base, tapering to an excised apex. Superior appendages long and slender ; apices dilated, a small wart at their bases. Upper penis-cover formed by two triangular plates set on edge. Penis short and straight, with a dilatation before the apex, which is produced in a slender spine. Lower penis-cover (or perhaps penis-sheaths) in the form of a pair of parallel, stout rods with truncate apices. Inferior appendages two-branched ; upper branch long and comparatively slender, inner surface heavily fringed with long, stiff spines ; lower branch stout, bent inwards at right angles, sinuous. A pair of short, membranous filaments to the fifth sternite ; a short, stout process to the seventh sternite and a slightly longer, stout process to the sixth, the latter carrying a few stout spines at its apex.

Genitalia, ♀.—From beneath, apical margin of the penultimate segment slightly produced and strongly fringed ; the terminal segment is hood-shaped, covering a narrow plate with serrate apical margin. From above, the extremity

of the apical segment is membranous and truncate, bearing a minute process at each apical angle. A short, pointed process to the sixth sternite and a longer and stouter one, bearing two or three long spines, to the fifth.

Length of anterior wing, ♂ and ♀, 8 mm.

AUSTRALIA : Queensland, National Park, 3000 ft., 22.xii.1921, 1 ♂ (*type*), R. J. Tillyard ; Victoria, Melbourne, 1 ♀, Edwards (McLachlan Collection).

TASMANIA : Cradle Mt., 15.i.1917, 1 ♀, R. J. Tillyard.

This species differs from the other described *Taschorema* spp. in the shortness of both ventral processes and in the two-branched inferior appendages in the ♂.

Taschorema evansi sp. n. (fig. 297).

Insect of medium size. *Head* very dark ochraceous ; oculi black. *Antennae* and *legs* ochraceous, *palpi* darker, of the same colour as the head. *Anterior wing* fuscous, clothed with short, black hairs intermingled with a few pale ones ; the usual white patches at the anastomosis and arculus. Fork no. 1 sessile. *Posterior wing* with a yellowish cell along 1A, 2A and 3A bearing rows of battledore scales ; a patch of similar but smaller scales is present on the anterior wing in the post-costal area.

Genitalia, ♂.—Dorsal plate broad, somewhat rectangular, more strongly chitinized than is usual in the group, particularly towards the apex, where there are a few sparse hairs. Superior appendages long and slender ; apex slightly dilated ; a rounded wart situated immediately above the base. Upper penis-cover in the form of a pair of short, slender processes arising from broad bases ; apices turned slightly outward. Penis short and retracted. Lower penis-cover formed by two narrow plates, broadened from the side. From beneath, dilated angularly towards the apex. Inferior appendages large, from the side, much broadened towards the apex, where the margin is truncate and excised : it carries a ridge on the inner surface densely clothed with a mass of teeth. Apical margin of the ninth sternite widely excised. Short, transparent filaments to the fifth segment. A short, stout process to the seventh sternite and a longer one to the sixth, bearing on its under surface two pairs of peg-like teeth.

Length of anterior wing, ♂, 8 mm.; ♀, 9 mm.

TASMANIA : Lake Leake, ii.37, 1 ♂ (*type*), 2 ♀ (lacking abdomens), J. W. Evans.

T. evansi differs from the foregoing species in the presence of lateral filaments on the fifth sternite, and in having the process to the sixth sternite considerably longer than that on the seventh.

Taschorema ochracea sp. n. (figs. 298, 299).

Insect yellowish, of medium size. *Head* ochraceous, oculi black. *Antennae* pale ochraceous, paler than the head. Basal joint of the same colour as the remaining joints. *Legs* and *palpi* ochraceous. *Anterior wing* broadened at the apex, which is very oblique, of a pale cream colour, with numerous small patches of dark and golden, semi-erect hairs forming irrorations. Pterostigma

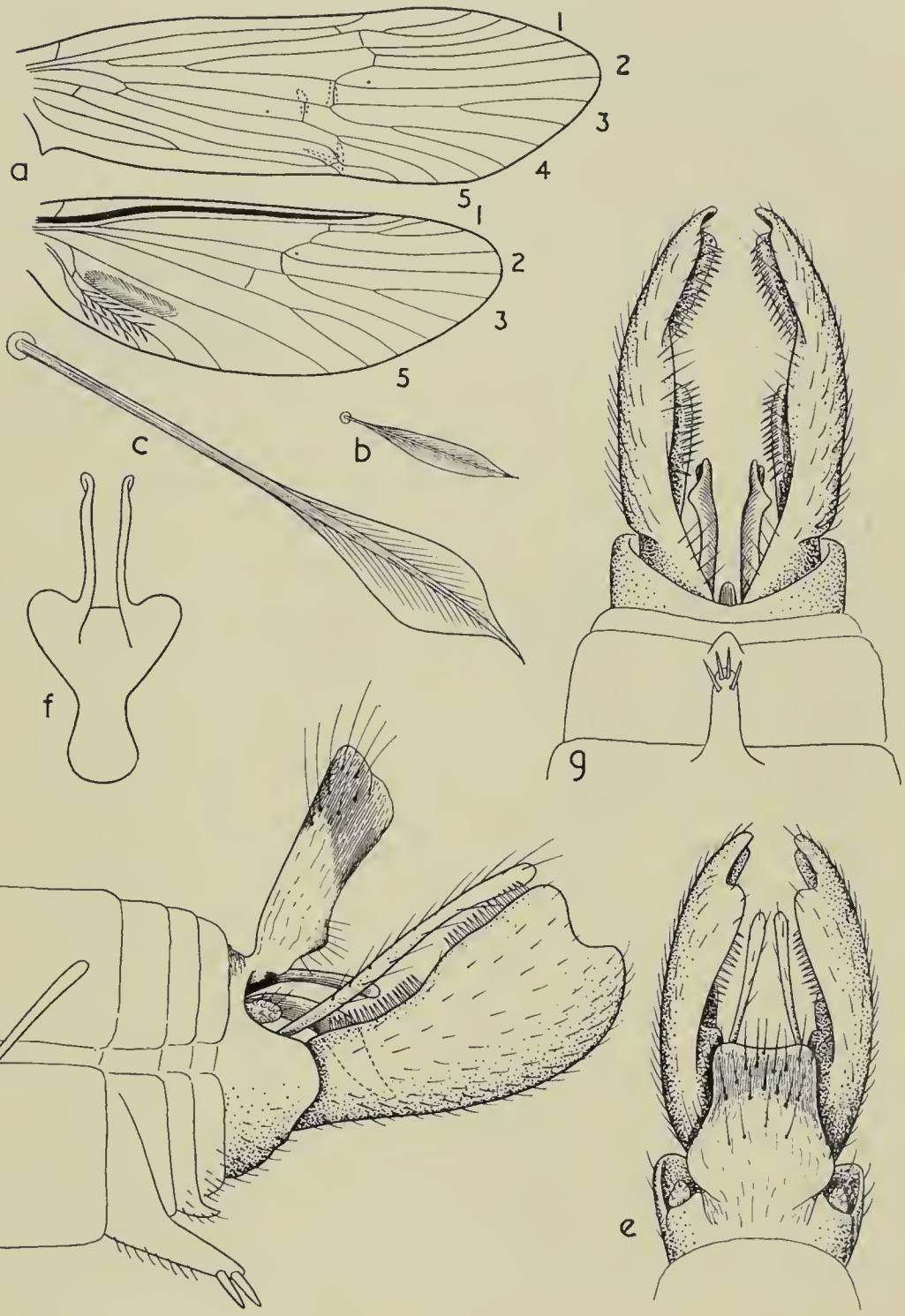

FIG. 297.—*Taschorema evansi* sp. n. ♂. *a*, wings; *b*, scale from postcostal area of anterior wing; *c*, scale from anal vein of posterior wing; *d*, genitalia, lateral; *e*, dorsal; *f*, upper penis-cover, dorsal; *g*, inferior appendages, lower penis-cover, ventral.

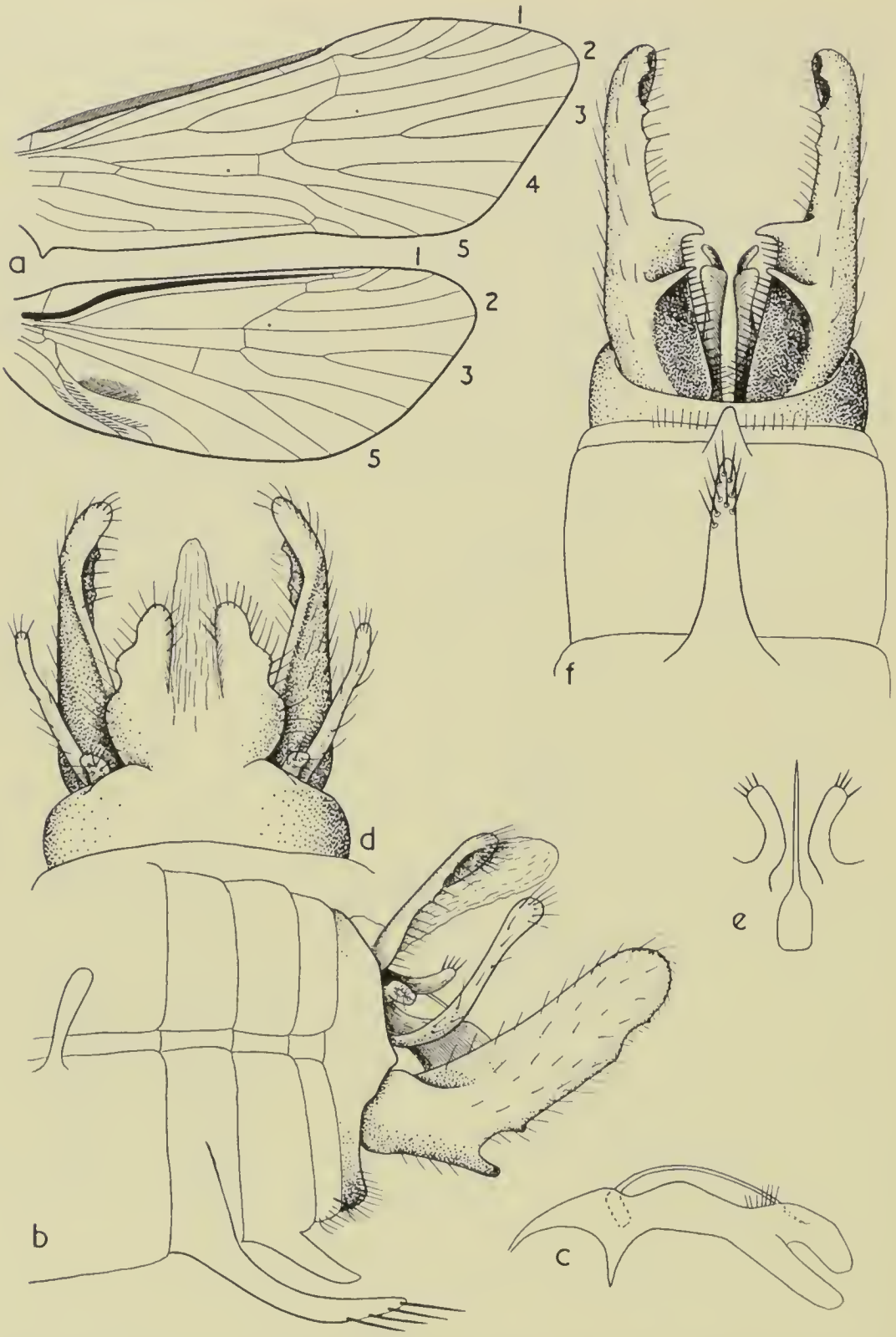

FIG. 298.—*Taschorema ochracea* sp. n. ♂. *a*, wings; *b*, genitalia, lateral; *c*, penis and lower penis-cover, lateral; *d*, penis and upper penis-cover, dorsal; *f*, genitalia, ventral (upper penis-cover omitted).

darker than the rest of the wing. Apical fringe dark. Costa folded over the sub-costa in the ♂ but not in the ♀; in the former sex, no distinguishable specialized scales in the post-costal area. *Posterior wing* yellowish. In the ♂, the cell along the first anal vein inconspicuous ; battledore scales along the anals narrow and inconspicuous. Abdomen dark above, pale ochraceous beneath.

Genitalia, ♂.—Apical margin of the ninth tergite produced at the centre in a large dorsal plate, oblong in shape with crenulate lateral margins, the centre membranous, produced beyond the apical margin and also downward

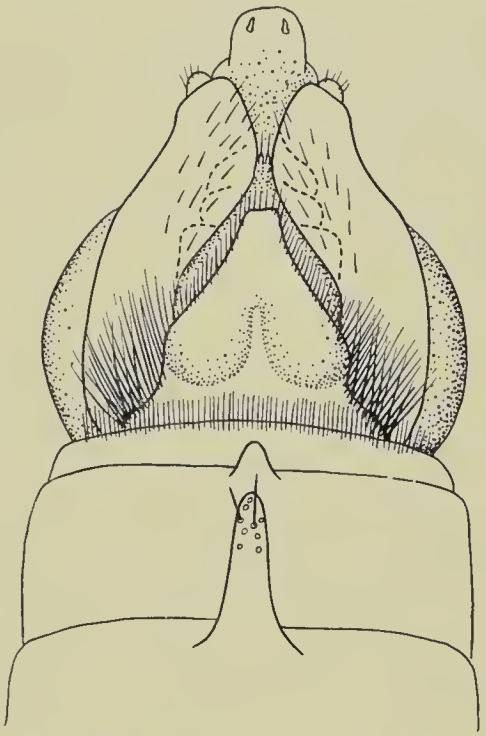

Fig. 299.—*Taschorema ochracea* sp. n. ♀ genitalia, ventral.

through the plate to make a membranous keel. Superior appendages short, no longer than the dorsal plate, the warts at the bases rather large and produced. Upper penis-cover formed by two stout processes curving outwards, apices armed with strong teeth. Penis in the form of a long spine arching downward between the processes of the upper cover. Lower penis-cover consisting of a pair of plates, each bifurcate at the apex ; upper fork more strongly chitinized and slightly shorter than the lower. Inferior appendages large, each with a pair of short, claw-like branches at the base, one below the other, strongly dentate along the lower margin towards the apex. The usual densely fringed central ridge, armed perhaps with teeth or spines rather than soft hairs, particularly towards the base. Lateral filaments of the fifth segment short and membranous ; process of the seventh sternite large ; that of the sixth still larger, with the under surface at the apex bearing strong teeth.

Genitalia, ♀.—The apex of the abdomen is bluntly triangular from all aspects. From beneath, there is a large, strongly chitinized, triangular plate with two deep, brown-pigmented hollows on the dorsal surface, giving the appearance of two narrower plates welded together at their apices but separated at their bases. The sides of this plate are sparsely fringed, and strong ridges continuing the sides of the plate to the base of the segment are very heavily fringed with a mat of long hairs. Above the plate, the sides of the apical segment are turned under and back to leave a triangular cleft fringed with long, dark hairs. Apical margin of the eighth sternite closely fringed ; a stout, short process to the seventh and a very long one to the sixth sternite, the latter armed at its apex with a few spines.

Length of the anterior wing, ♂, 8 mm. ; ♀, 10 mm.

AUSTRALIA : Queensland, National Park, 3000 ft., 24.xii.1921, 1 ♀, 25.xii.1921, 1 ♂ (*type*) 28.xii.1921, 1 ♂ ; 30.xii.1921, 1 ♀. TASMANIA : Cradle Mt., 16.i.1917, 1 ♀ (Tillyard Collection).

Closely related to *T. evansi*, from which it differs in the form of the male genitalia, and in having the costa of the anterior wing folded over on to the subcosta in the ♂.

Notiobiosis Banks.

Notiobiosis Banks, 1939, *Bull. Mus. comp. Zool. Harv.*, 85 : 499.
Percivalia McFarlane, 1939, *Trans. Proc. R. Soc. N.Z.*, 69 : 331 (syn. nov.).

Banks describes the genus as follows :

"In general similar to *Hydrobiosis* ; the anastomosis being before the base of the stigmal region, the spurs 2-4-4 : discal cell closed, and several times as long as broad, fork one reaching to discal cell, fork two going back on the discal cell or at least reaching to it."

Type species.—*Notiobiosis pallescens* Banks, 1939.

In the two species known to me, *cassicola* and *maxima* of McFarlane, there is an interesting structure within the abdomen of the ♂, probably a scent-organ, consisting of a pair of extrusible filaments united to rounded sacs, situated between the second and third ventral segments. These filaments can evidently be extruded between the segments, through apertures situated towards the ventro-lateral margins.

This structure is, no doubt, a generic character, though the two species described by Banks are unknown to me, and no reference is made to it in the descriptions. McFarlane, however, refers to this structure in the description of his synonymous genus, *Percivalia*. Ventral processes to the seventh, or to the sixth and seventh sternites in the ♂ ; margin of the eighth sternite also sometimes produced, but scarcely forming a ventral process.

KEY TO SPECIES OF *Notiobiosis*, MALES.

1. Processes to sixth and seventh sternites (Australian forms) . . . . . 2.
–. No process to the sixth sternite (New Zealand forms) . . . . . 3.
2. Fork no. 1 in posterior wing sessile . . . *N. pallescens* Banks (p. 445).
–. Fork no. 1 in posterior wing with a footstalk . . *N. nigrita* Banks (p. 446).

3. Margin of ninth ventral segment more or less produced between the bases of the inferior appendages in a triangular tongue . . . . . 4.
–. Margin of ninth ventral segment not so produced *N. cassicola* (McFarlane) (p. 447).
4. Inferior appendage from beneath slightly divergent, not incurved *N. maxima* (McFarlane) (p. 449).
–. Inferior appendages with apices incurved . . . . . 5.
5. Inferior appendages from beneath tapering from base to midway (inner margin straight or convex) and thence finger-like . . . . . 6.
–. Inferior appendages either more or less parallel-sided from beneath, or tapered from about midway to near apex . . . . . 7.
6. Inner basal margin of inferior appendage straight ; apices of upper penis-cover acute . . . . . *N. fusca* (McFarlane) (p. 449).
–. Inner basal margin of inferior appendage convex ; apices of upper penis-cover rounded . . . . . *N. shandi* (McFarlane)* (p. 540).
7. Inferior appendage in ventral view tapering from midway to apex, which is rounded . . . . . *N. banksiensis* (McFarlane) (p. 452).
–. Inferior appendage in ventral view more or less parallel-sided, apex truncate *N. borealis* (McFarlane)* (p. 540).

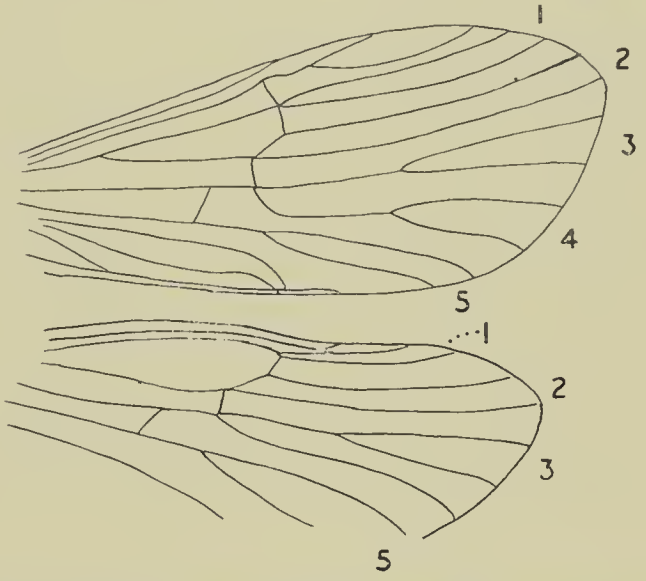

Fig. 300.—*Notiobiosis pallescens* Banks. Wings (after Banks).

Notiobiosis pallescens Banks (fig. 300).

Notiobiosis pallescens Banks, 1939, *Bull. Mus. Comp. Zool. Harv.*, 85 : 499–500, fig. 40.

Banks describes the species as follows :

"Head yellowish, clothed with white hair ; palpi pale ; antennae pale, faintly annulate with brown ; thorax pale, white hair on prothoracic warts and on middle of mesonotum ; abdomen brownish, paler beneath ; legs pale, tibiae slightly darker near middle and at tip, and tarsal articles often marked with dark."

"Fore wings pale brownish, with many white and yellowish scales and some scattered black hairs, longer white erect hairs on the veins and some black hairs, most noticeable near forking of medius and behind, apical fringe white, veins

* See Appendix.

brown in streaks, interrupted with paler ; stigma brown. Hind wings pale, with gray hair and fringe. On fore wings several hyaline white lines near middle, a fine line just above the medius, a transverse bar crossing medius some distance before forking, the cross-vein from radial sector to medius, and a mark from cubitus to end of anal veins."

" In fore wings fork one reaches discal cell, fork two back on discal cell for nearly width of cell, fork three about as long as its pedicel, fork four no longer than three, fork five much longer than four and more slender at tip, discal cell about four times as long as wide, cross-vein from medius to cubitus obliquely back. In hind wings fork one very narrow, reaching back to the cell, fork two obliquely broad on cell, fork three longer than its pedicel, fork five with a short pedicel."

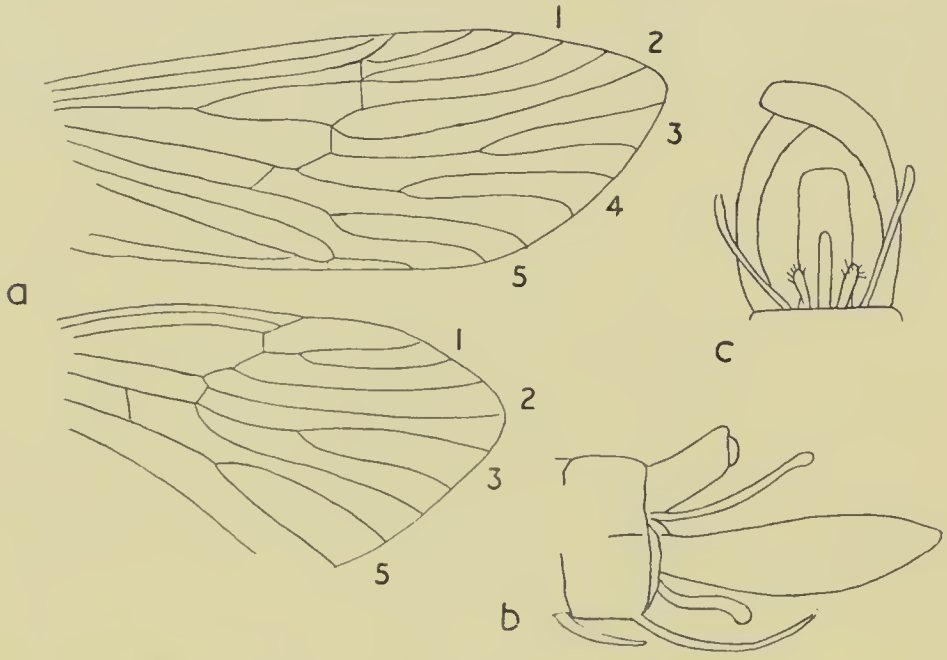

Fig. 301.—*Notiobiosis nigrita* Banks. ♂ (after Banks). *a*, wings ; *b*, genitalia, lateral ; *c*, dorsal.

" The abdomen has on venter, from sixth segment, a spine about as in *N. stigma* Ulmer, and at tip of seventh a short erect one with a truncate tip, shorter than *N. stigma*."

" Length of fore wing 10 mm."

" From Pemberton, West Australia, 19 Nov. (Darlington)."

Type in the Museum of Comparative Zoology, Harvard College, U.S.A.

Notiobiosis nigrita Banks (fig. 301).

Notiobiosis nigrita Banks, 1939, *Bull. Mus. Comp. Zool. Harv.*, 85 : 500–501, figs. 45, 46, 72.

Banks describes the species as follows :

" Head black, clothed with black hair : palpi brown ; antennae brown, faintly annulate with pale at the joinings : thorax black and with rather long black hairs : the prothoracic warts pale ; abdomen black ; legs pale, tarsi rather brownish."

"Fore wings blackish, with black hair and fringe; stigma very dark and prominent, there are a few patches of golden hair at ends of anal veins, on cubitus before forking, and others near the anastomosis, these on the veins, and on the membrane at tip of stigmal area is a yellowish spot. Hyaline white lines as follow :— one up from end of anals, one over cross-vein from radial sector to medius and this extending down to the base of fork four; veins uniform brownish. Hind wings gray, with black hair and fringes. In fore wing discal cell is over three times as long as broad, fork one sessile on cell, fork two back fully width of cell, fork three longer than its pedicel, fork four still longer, and about as long as fork five, cross-vein from medius to cubitus obliquely back. In hind wings fork one has a short pedicel, fork two obliquely back on cell, fork three with pedicel one half its length, fork five long and wide."

"Male genitalia show a median blunt process, a very slender piece each side, and below a long, broad clasper, tapering toward the incurved tip, and below these a pair of short curved slender pieces, from above one sees a broad penis with truncate tip. The claspers, from behind, are seen to be fringed on the lower inner edge with a row of long, curved bristles. On the sixth ventral segment is a stout spine reaching across seventh segment, and from the tip of seventh is a still longer and slightly upcurved spine, which, from below, is seen to be rather broad throughout."

"Fore wing, 9·5 mm. long."

"From Mt. Spurgeon, North Queensland, Australia, 3500 to 4000 ft., 26 July (Darlington)."

Type in the Museum of Comparative Zoology, Harvard College, U.S.A.

Notiobiosis cassicola (McFarlane) (fig. 302).

Percivalia cassicola McFarlane, 1939, *Trans. Proc. R. Soc. N.Z.*, **69** : 333, figs. 2, 13–15.

Head and oculi dark ochraceous; frons clothed with black and golden hairs. *Antennae* dark ochraceous with darker annulations. *Legs* fuscous with very conspicuous golden patches at the apices of the tarsal joints. *Anterior wing* dark ochraceous with numerous, erect, black hairs and a few white markings on the membrane.

Genitalia, ♂.—Apical margin of the eighth tergite and also of the sternite densely fringed with hairs, except at the centre of the lateral margins. There is a very narrow dorsal plate with a slightly dilated apex, directed upward and tailward from the side. Superior appendages long and slender, fringed. Upper penis-cover from above in the form of a pair of long blades, well below the base of the dorsal plate. On each side, at the base, on the margin of the segment is a minute rounded wart. Penis in the form of a fine spine curving upward, and above it is a pair of very strongly chitinized, upturned hooks, their outer margins set with a close row of sharp, saw-like teeth. Penis-sheaths long, with bifurcate apices. Lower penis-cover has a membranous base, terminating in a pair of twisted spines. Inferior appendages long, from the side stout at the base; from beneath, tapering to slender, rounded apices, with angular projections of the inner margins about midway. Eighth sternite triangularly produced at the centre of its apical margin; a strong process to the seventh sternite.

Length of anterior wing, ♂, 11 mm.

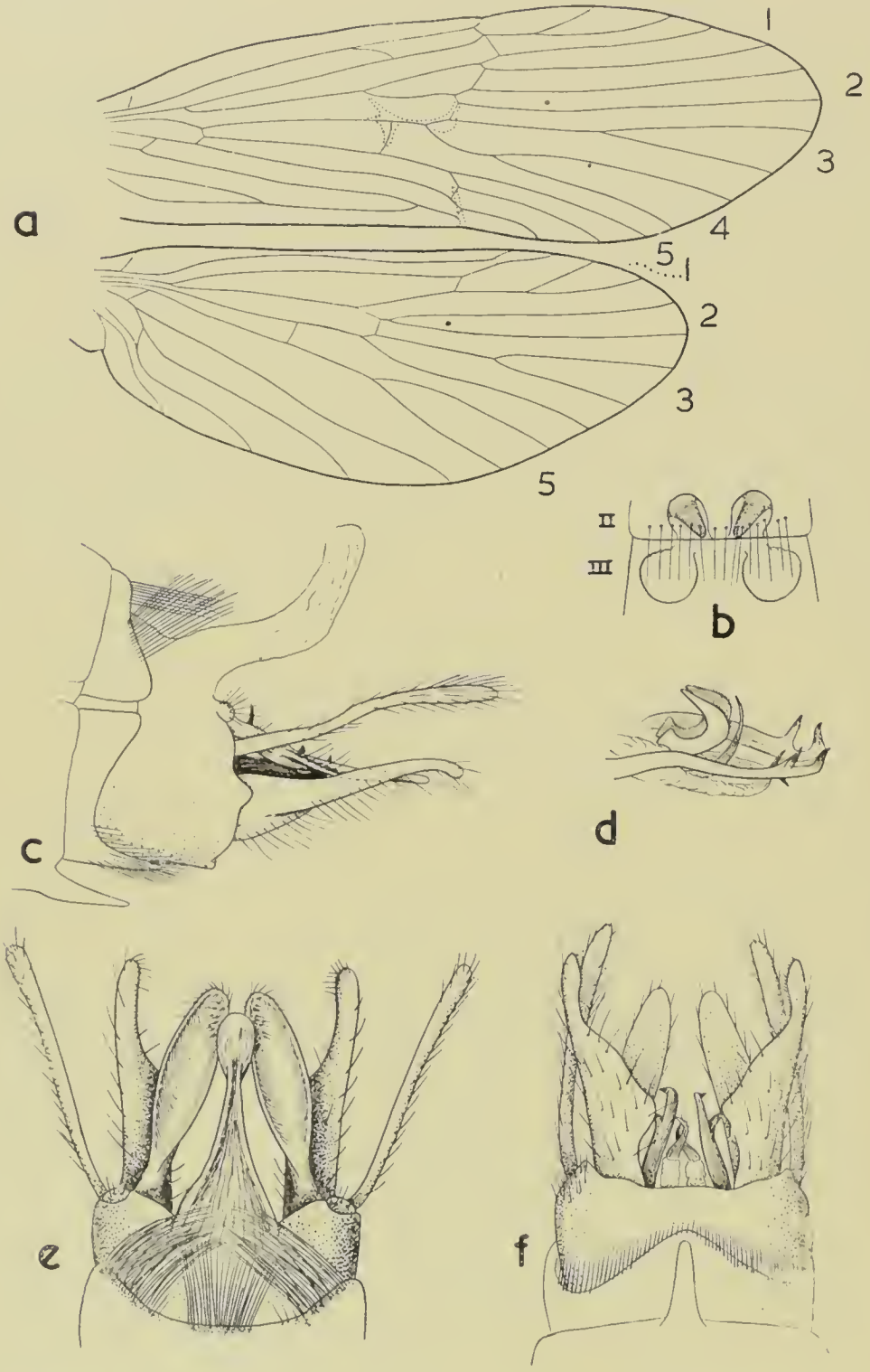

FIG. 302.—*Notiobiosis cassicola* (McFarlane). ♂. *a*, wings; *b*, scent-organ on second and third abdominal sternites; *c*, genitalia, lateral; *d*, penis, etc., dorso-lateral; *e*, genitalia, lateral (penis, etc., omitted); *f*, ventral (dorsal plate omitted).

New Zealand : Upper Waimakariri River watershed, small rapid streams in beech forest, 2–3000 ft., A. G. McFarlane ; Wellington, Day's Bay, 22.xii.1932 ; Wilton's Bush, 11.ii.1936, G. V. Hudson.

Type and paratype, ♂, in the collection of the Canterbury Museum, N.Z., and other examples in the British Museum (N.H.).

Notiobiosis maxima (McFarlane) (fig. 303).

Percivalia maxima McFarlane, 1939, *Trans. Proc. R. Soc. N.Z.*, **69** : 331, figs. 1, 5, 7, 9, 10.

Insect pale and rather large, anterior wing being 15 mm. in length. Pterostigma strongly marked. In the single ♂ example before me there are aberrations in the neuration, consisting of a small cross-vein in the *anterior wing* towards the middle of fork no. 2, on one side only, and a cross-vein in the *posterior wing* between the radius and its sector, fully developed on one side but only partly present on the other. Female similar in general appearance and neuration to the male. In the former sex there is a small process to the penultimate and a stronger one to the ante-penultimate segment.

Genitalia, ♂.—Apical margin of the eighth tergite widely excised and heavily fringed. Margin of the ninth membranous and obscure at the centre, slightly more chitinized at the sides. The centre is produced in a membranous dorsal plate, rather narrow and tapering to a truncate apex. The lower outer margins are joined to the upper penis-cover, a pair of processes of about the same length as the plate. These processes are constricted at the base, gradually dilating to the apex, and on their upper and outer surfaces are strong, basally directed, short spines or teeth. Outside the bases of these processes is a pair of rounded warts. Superior appendages very long and slender, slightly dilated towards their apices. Penis directed upward rather abruptly, with on its upper surface a pair of thick, very strongly chitinized, downwardly directed, acute processes. Penis-sheaths long, directed slightly downward, dilated and fringed immediately before the apices, which are produced in upcurved points. Inferior appendages short and rather stout. Apical margin of the ninth sternite bluntly produced ; a broad spatulate process to the seventh sternite.

Length of anterior wing, ♂ and ♀, 15 mm.

New Zealand : Upper Waimakariri River watershed, small stony streams in beech forest, 1–3000 ft., A. G. McFarlane ; Arthur's Pass, 27.xi.1920, T. R. Harris.

Type, ♂, paratype, ♀, in the collection of the Canterbury Museum, N.Z. ; other examples in the British Museum (N.H.).

Notiobiosis fusca (McFarlane) (fig. 304).

Percivalia fusca McFarlane, 1939, *Trans. Proc. R. Soc. N.Z.*, **69** : 332, 333, figs. 6, 11, 12.

I am unacquainted with this species, which McFarlane describes as follows :

" Expanse : 22–25 mm."

" Smaller and darker than *P. maxima*."

" Head less hairy than *P. maxima* ; vertex hairs black with lighter hairs inter-

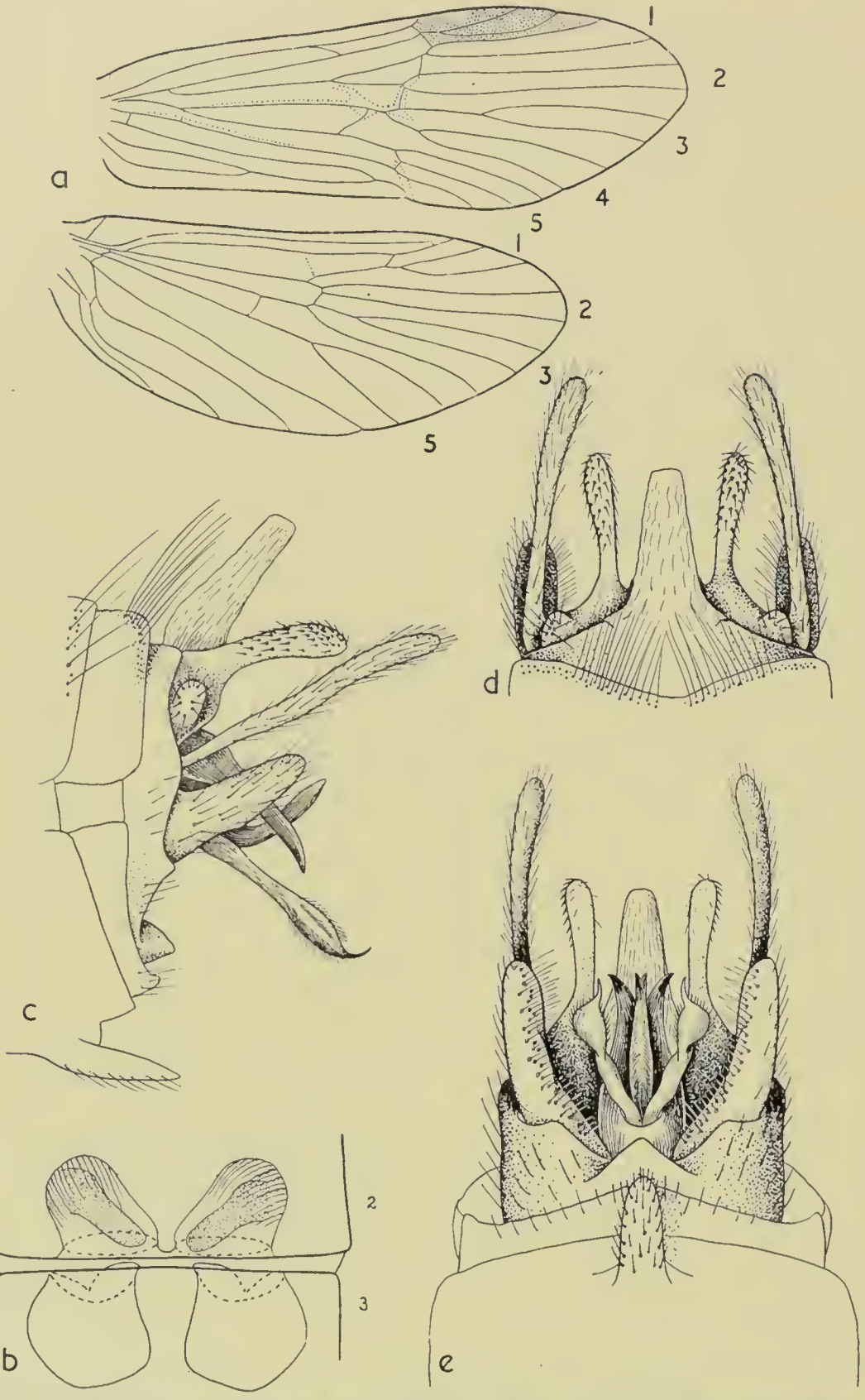

FIG. 303.—*Notiobiosis maxima* (McFarlane). ♂. *a*, wings; *b*, scent-organ on second and third abdominal sternites; *c*, genitalia, lateral; *d*, dorsal; *e*, ventral.

mixed ; lighter hairs predominating on the frons ; oculi black with light lines and flecks, these probably being post-mortem effects ; ocelli small, light ; maxillary palpi covered on upper and outer surfaces with dense, fine, fuscous hair ; labial palpi with fine light hair ; antennae shorter than forewing, fine, dark, clothed in fine blackish hair to the tips."

"Thorax less hairy than *P. maxima*, mesothorax having light hair on the two ridges ; legs light yellowish brown in proximal parts, first and second pairs brownish black with bands of yellowish on tibiae and tarsi, third pair light yellowish-brown as far as tarsi, which are lighter than other pairs."

"Wings : forewing pterostigma well defined ; venation yellowish, strongly defined ; surface of wing, with dense fuscous hairs, longer than in *P. maxima*. From the distal end of the pterostigma, a light crescentic band crosses the wing ; several

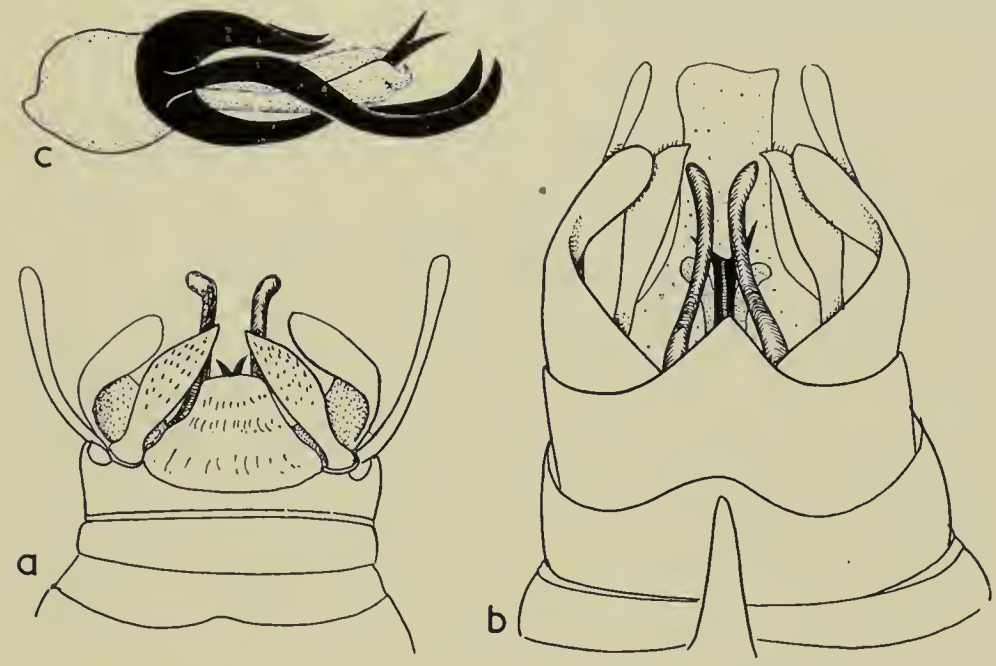

FIG. 304.—*Notiobiosis fusca* (McFarlane). ♂ genitalia (after McFarlane). *a*, dorsal ; *b*, ventral ; *c*, penis, etc., lateral.

light spots basad from this, marking patches of light hair rising from the veins, which are clad mainly with upstanding fuscous hair ; light spots on the margin between the termini of the veins ; fringe dense, varying from light to fuscous ; hind-wing hyaline, dark smoky effect distally ; fringes in anal region, long, light and silky."

"Abdomen : female, tooth on fifth sternite as long as succeeding sternite and slightly curved ; tooth on sixth short, and blunt ; seventh or ultimate visible sternite longer than the preceding ones, notched posteriorly ; the eighth tergite appears to have no corresponding sternite. Male : long tooth on seventh sternite ; eighth sternite short with broadly rounded backward extension, ventrally, of the posterior margin ; posterior margin of the ninth sternite produced to a point mid-ventrally. Dorsally, the posterior margin of the ninth tergite is excised by a shallow bight about two-thirds of its width, and from this the proctiger rises. From the sides of this excision the club-like superior appendages [upper penis-cover.—

D. E. K.] point downwards and inwards ; their ends are pointed and dorsal surface studded with short blunt spines : between the superior [upper penis-cover.—D. E. K.] and intermediate [superior.—D. E. K.] appendages lies a low wart-like ridge ; intermediate [superior.—D. E. K.] appendages, rounded, longer than the others ; the inferior appendages rise from a cavity and are directed postero-dorsally ; they curve in towards the mid-line so that the inner surfaces come to face ventrally at the distal end. Aedeagus, dark brown : penis bifid at point, directed upwards between a pair of hooked guides, which partly surround it near the point ; a pair of stout pointed rods rise dorsal to the penis ; conspicuous dark brown rod-like parameres curve from the base, outwards and downwards, and turn up at the points."

"Holotype ♂ and allotype ♀ and series of paratypes in Canterbury Museum."

"Habitat : [New Zealand : Upper Waimakariri River watershed] small rapid streams in beech forest between 2000 and 3000 ft."

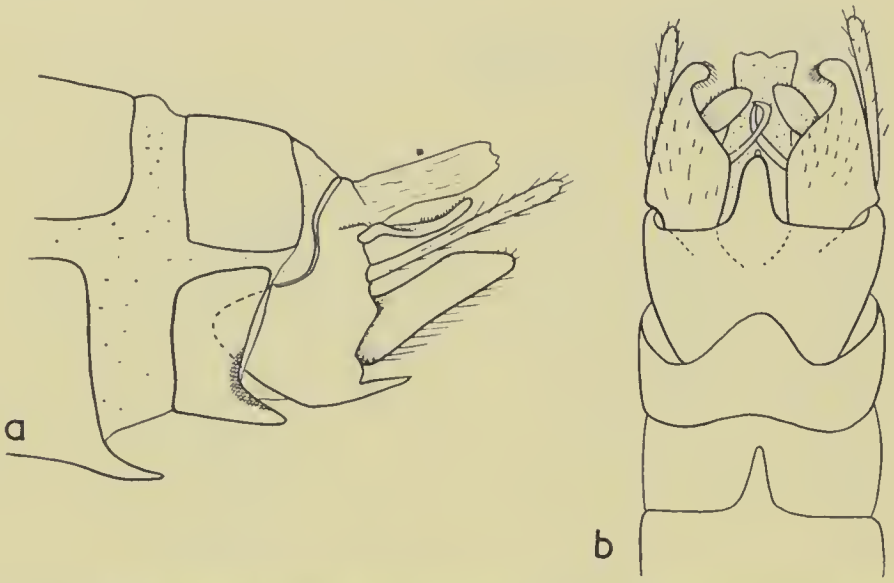

Fig. 305.—*Notiobiosis banksiensis* (McFarlane). ♂ genitalia (after McFarlane). *a*, lateral ; *b*, ventral.

Notiobiosis shandi (McFarlane).

(See Appendix, p. 540.)

Notiobiosis banksiensis (McFarlane) (fig. 305).

Percivalia banksiensis McFarlane, 1939, *Trans. Proc. R. Soc. N.Z.*, **69** : 234, 235, figs. 16, 17.

I am unacquainted with this species, which McFarlane describes as follows :

"Expanse 24 mm."

"This insect is uniformly light golden-brown throughout and conforms closely with the genotype."

"Abdomen ♂ short tooth on antepenultimate sternite ; penultimate sternite with broadly rounded mid-ventral extension ; ultimate sternite drawn out on posterior margin to a blunt peg-like process, thin and almost transparent ; viewed laterally the three terminal sternites appear to be toothed ; ultimate tergite reduced

to a strong ring of chitin, convex posteriorly; posterior margin of the penultimate tergite with two tufts of hair widely separated; the under side of the proctiger has a backward-pointing, V-shaped, sclerotised band; superior appendages [upper penis-cover.—D. E. K.] club-shaped from above, dorso-ventrally flattened; inferior appendages broad basally, tapering sharply on the inner side to turn abruptly inward at the tip; aedeagus of usual type for genus; large brown parameres, somewhat like a red deer's antler, tip turned sharply outward, two outwardly directed tynes at third distance from tip and base respectively, the basal one much the larger; viewed from below the parameres make a double crossing near the tip."

"Holotype, unique ♂ Canterbury Museum Collection; abdomen in balsam."

"Taken by A. L. Tonnoir at Hilltop, Banks Peninsula, January, 1925. [N. Zealand.]"

"I have taken what appear to be the larvae of this species in a stream on the Peninsula."

Notiobiosis borealis (McFarlane).

(See Appendix, p. 540.)

Anachorema gen. n.

The genus is related to *Notiobiosis* Banks, the main differences being the absence of the pair of scent-organ bodies between the second and third segments in the ♂, the presence of short lateral filaments to the fifth segment, and the spur formula, which is 1, 4, 4 or 2, 4, 4. Fork no. 1 in posterior wing sessile, except in *A. evansi* sp. n.

The *genitalia* differ rather widely from the general pattern in the group, there being a long, slender, bifurcate process arising from the centre of the margin of the ninth sternite, except in *A. evansi* sp. n., where it is replaced by a production of the apical margin, with a bifurcate apex; ventral process either present or absent.

Type species.—*Anachorema tasmanica* sp. n.

Key to Species of *Anachorema*.

1. Fork no. 1 in posterior wing sessile. Spurs 1, 4, 4 . . . . . 2.
–. Fork no. 1 in posterior wing about as long as its footstalk. Spurs 2, 4, 4 . . . . . *A. evansi* sp. n. (p. 460).
2. Fork no. 2 in posterior wing with a very short footstalk *A. brevis* sp. n. (p. 456).
–. Fork no. 2 in posterior wing shorter than its footstalk . . . . . 3.
3. Inferior appendage ♂ two-jointed. Fork no. 3 in anterior wing shorter than its footstalk . . . . . *A. seona* sp. n. (p. 458).
–. Inferior appendage ♂ single-jointed; apex bifid. Fork no. 3 in anterior wing longer than its footstalk . . . . *A. tasmanica* sp. n. (p. 453).

Anachorema tasmanica sp. n. (figs. 306, 307).

Head black, with black and a few hoary hairs; *ocelli* white. *Antennae*, basal joint black, remaining joints dark ochraceous. *Legs* and *palpi* light chocolate-brown. *Maxillary palpi*, ♂: basal joint short, second and third about equal and longer than the first, fourth slightly longer than the first but shorter than the third, fifth slightly longer than the third; in the ♀ the fourth

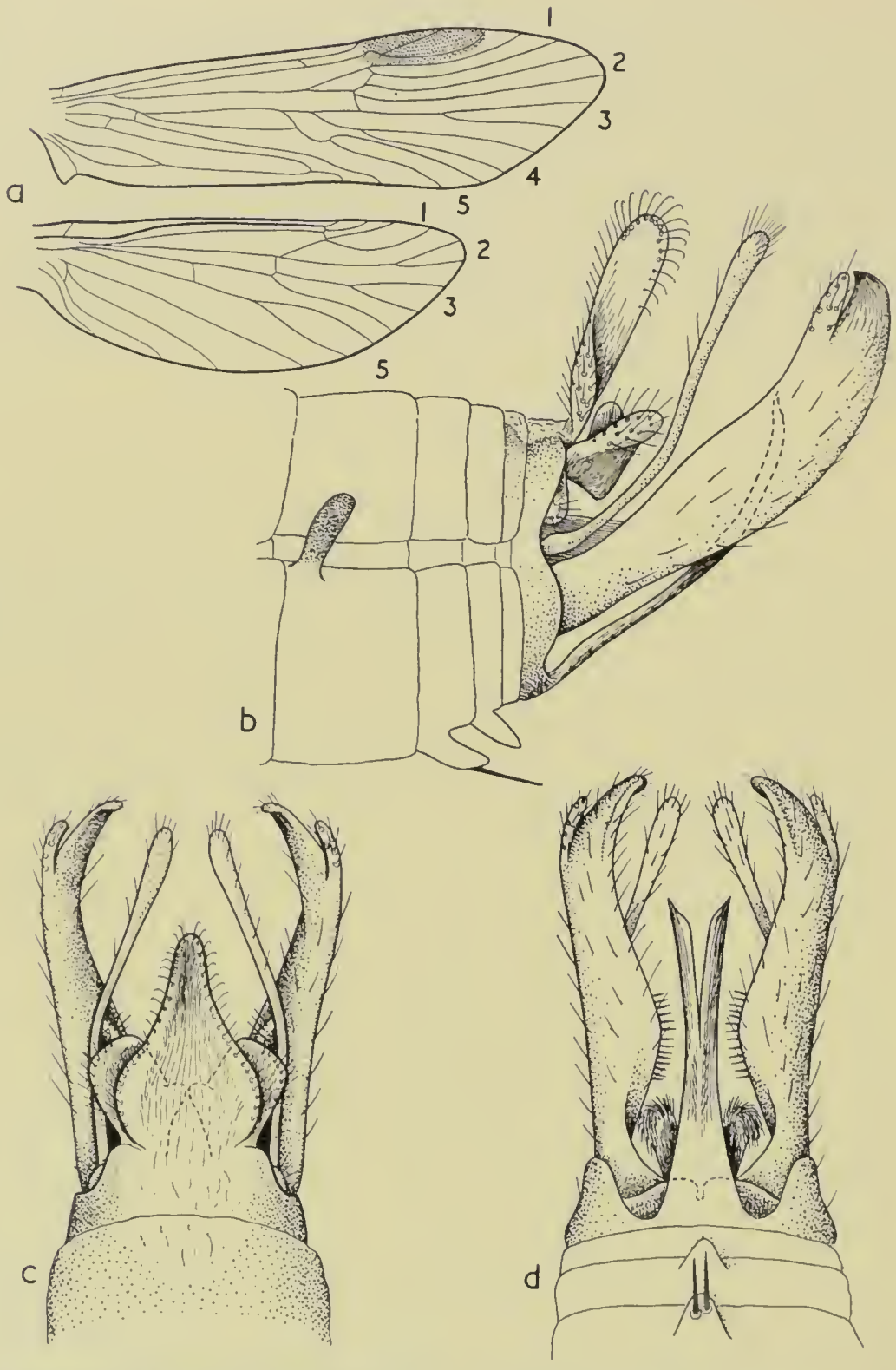

FIG. 306.—*Anachorema tasmanica* gen. sp. n. ♂. *a*, wings; *b*, genitalia, lateral; *c*, dorsal; *d*, ventral.

joint is as long as the third. *Wings* chocolate-brown ; *neuration* as indicated in the figure. In the *anterior*, pterostigma very strongly indicated ; in the *posterior*, the sub-costa is thickened, and shortly after its base is nearly confluent with the costa. In the *posterior wing*, ♀, there is a dark, circular patch consisting of a mass of black hairs, which are erect along the veins. *Spurs* 1, 4, 4.

Genitalia, ♂.—The eighth and ninth tergites are pigmented along their lateral borders, the centres appearing as colourless membranes. In the ninth this membrane is extended in a semi-membranous dorsal plate, which is

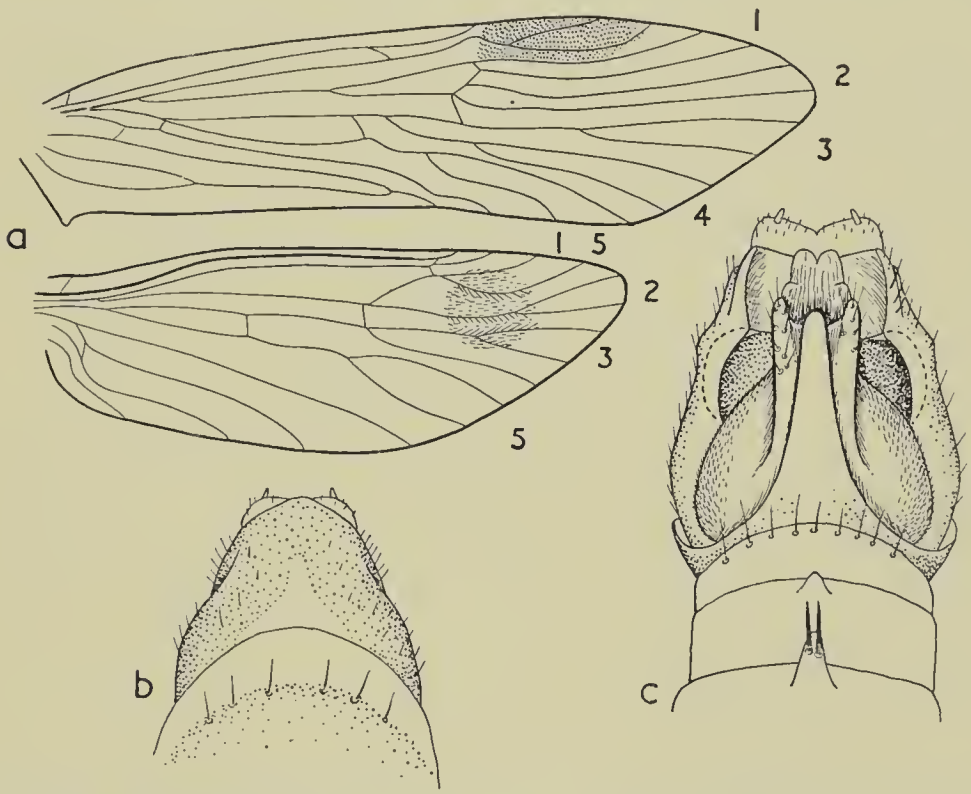

Fig. 307.—*Anachorema tasmanica* gen. sp. n. ♀. *a*, wings ; *b*, genitalia, dorsal ; *c*, ventral.

flask-shaped, the broad, bulbose base tapering abruptly to a rounded apex ; the tapered portion is trough-shaped and the entire margin of the plate is fringed with short, stiff hairs ; from the side, the plate shows a fringed keel. Superior appendages long and slender, curving upwards, about as long as the inferiors ; above their bases, on the margin of the segment, is a small, elongate wart. Upper penis-cover formed by two horizontal plates with the inner margins produced in small, rounded processes which touch each other. The lower margin of the plate, seen from the side, is produced downward in a triangular keel. Penis straight and membranous. Lower penis-cover formed by a pair of heavily fringed, downcurved, hooked plates. Inferior appendages branched, very long, stout, curving slightly upward, with the inner surface

swollen about midway, the swollen part bearing a small, dense mat of teeth. The branch is short and membranous, arising from the upper margin near the apex and lying parallel with the margin. Centre of the apical margin of the ninth sternite produced in a long, bifurcate spine ; a short, stout process to the seventh sternite, and a larger one bearing two spines to the sixth ; very short, stout, black, lateral filaments to the fifth segment.

Genitalia, ♀.—The abdomen terminates in a blunt apex ; from beneath may be seen a pair of narrow plates with much produced apices merging in the tubular piece, enclosing a long, narrow, triangular plate ; these side plates bear patches of minute setae. From above, the terminal segment is produced, with a truncate apical margin and with a strongly pigmented area enclosing a clear, triangular patch of membrane as shown in the figure. A short process to the sixth sternite and a longer one, bearing two spines, to the fifth ; no lateral filaments.

Length of the anterior wing, ♂, 5·5 mm. ; ♀, 6 mm.

TASMANIA : New Norfolk, iii, 1938, 5 ♂, 3 ♀, J. W. Evans ; AUSTRALIA : New South Wales, Heatheote, 17.iii.1917, 6 ♂, 2 ♀ ; Hornsby, 24.iii.1917, 1 ♀ ; Wentworth Falls, 24.ii.1916, 1 ♀, from the Tillyard Collection.

Type ♂, New Norfolk, mounted in balsam.

Anachorema brevis sp. n. (fig. 308).

Insect of medium size. *Head* dark ochraceous ; basal joint of the *antenna* of the same colour, remaining joints paler. *Palpi* dark ochraceous. *Legs* pale ochraceous. *Wings*, *anterior* ochraceous, with three conspicuous white streaks in the membrane, one connecting the lower distal angle of the discoidal cell with the base of fork no. 4 ; another connecting the base of the discoidal cell with the distal angle of the cellula thyridii, and the third at the arculus ; discoidal cell short. *Spurs* 1, 4, 4.

Genitalia, ♂.—Centre of the apical margin of the ninth tergite produced in a wide dorsal plate with small, lateral warts at the base. The plate is composite in structure, a narrow, membranous centre with an acute apex and wide, lateral, fringed shelves. From the side, the margins of the centre portion are seen to be produced downward through the plate to make shallow fringed keels. . Superior appendages long and slender. Upper penis-cover formed by two widely separated, narrow plates ; inner apical angles produced in acute, curved spurs ; outer angles somewhat raised, membranous, and bearing a few hairs. Penis hidden in a trough-shaped lower penis-cover, of which the upper margin is humped towards the centre ; lower margin sinuous, apex excised. Inferior appendages stout, not extending beyond the apex of the dorsal plate, apex trilobed. From the side, upper lobe broad, with an obliquely truncate apical margin ; of the other two, both are slender, the lower more strongly chitinized than the upper. Process of the ninth sternite excised nearly to its base to form a pair of long, slightly sinuous spines, bent upward at right angles between the inferior appendages, with slender, lateral branches arising a little distally from midway. Lateral filaments very short, ochraceous, one broken away in the type. No ventral processes.

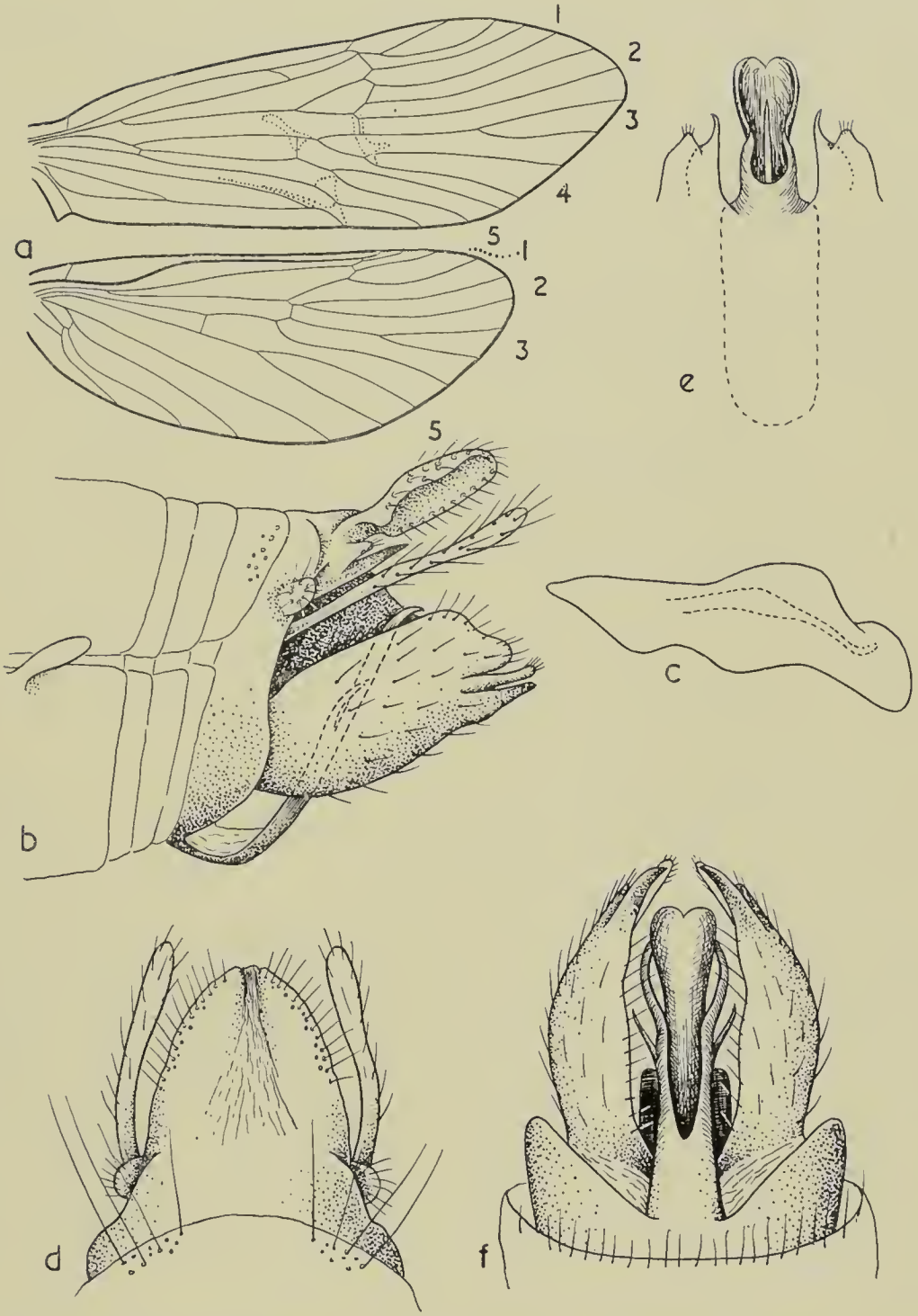

FIG. 308.—*Anachorema brevis* sp. n. ♂. *a*, wings; *b*, genitalia, lateral; *c*, penis and lower penis-cover, lateral; *d*, genitalia dorsal (inferior appendages and penis, etc., omitted); *e*, penis, upper and lower penis-covers, dorsal; *f*, genitalia, ventral (dorsal plate and superior appendages omitted).

Length of the anterior wing, ♂, 8 mm.

Tasmania : Cradle Mt., 18.i.17, 1 ♂, R. J. Tillyard.

This species is related to the type species in pattern of the genitalia but differs in detail. There are no ventral processes, and apical fork no. 2 in the posterior wing is much longer than its footstalk.

Anachorema seona sp. n. (figs. 309, 310).

Insect collected in fluid. *Neuration* as figured. *Spurs* 1, 4, 4.

Genitalia, ♂.—Distal margin of the ninth segment from above deeply and widely excised. In the excision is a membranous, triangular plate directed upward, with lateral margins fringed with hairs ; at the base on each side is a rounded wart. Beneath is a pair of widely separated, slightly sinuous,

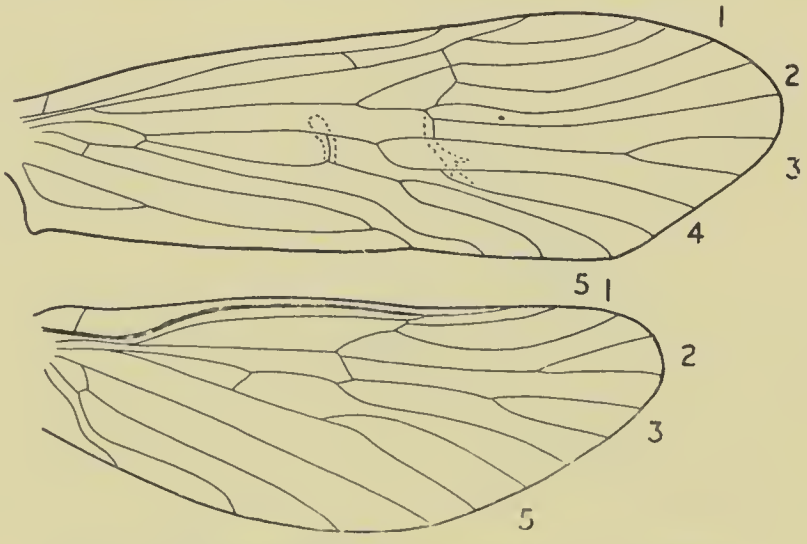

Fig. 309.—*Anachorema seona* sp. n. ♂ wings.

spine-like processes arising from wide bases, no doubt an upper penis-cover. Superior appendages long and slender, extending beyond the rest of the genitalia, apices slightly clavate. Penis with the apex dilated from beneath, deeply cleft, with a narrow, hooked keel on its under surface ; no visible lower penis-cover. Inferior appendages two-jointed ; basal joint stout, sausage-shaped from the side, apex produced in a blackened claw somewhat inturned ; terminal joint very short, shaped like an inverted boot with a slightly concave sole. The ventral margin of the ninth segment is widely excised and at the centre of the excision arise two long, strongly chitinized spines, curving upwards towards the penis to lie one on each side of the central keel. A short process to the seventh sternite and another to the sixth bearing a pair of fairly long spines ; the lateral processes of the fifth sternite are short and wide ; the dorsal surface of the abdomen is patterned with small circular discs.

Length of the anterior wing, ♂, 5·5 mm.

Tasmania : R. Ouse, 4.ii.1933, 1 ♂, R. J. Tillyard.

Type, ♂, mounted as a microscope preparation. *A. seona* differs from *A. tasmanica* in the two-jointed inferior appendages of the ♂ and the relatively shorter fork no. 3 in the anterior wing.

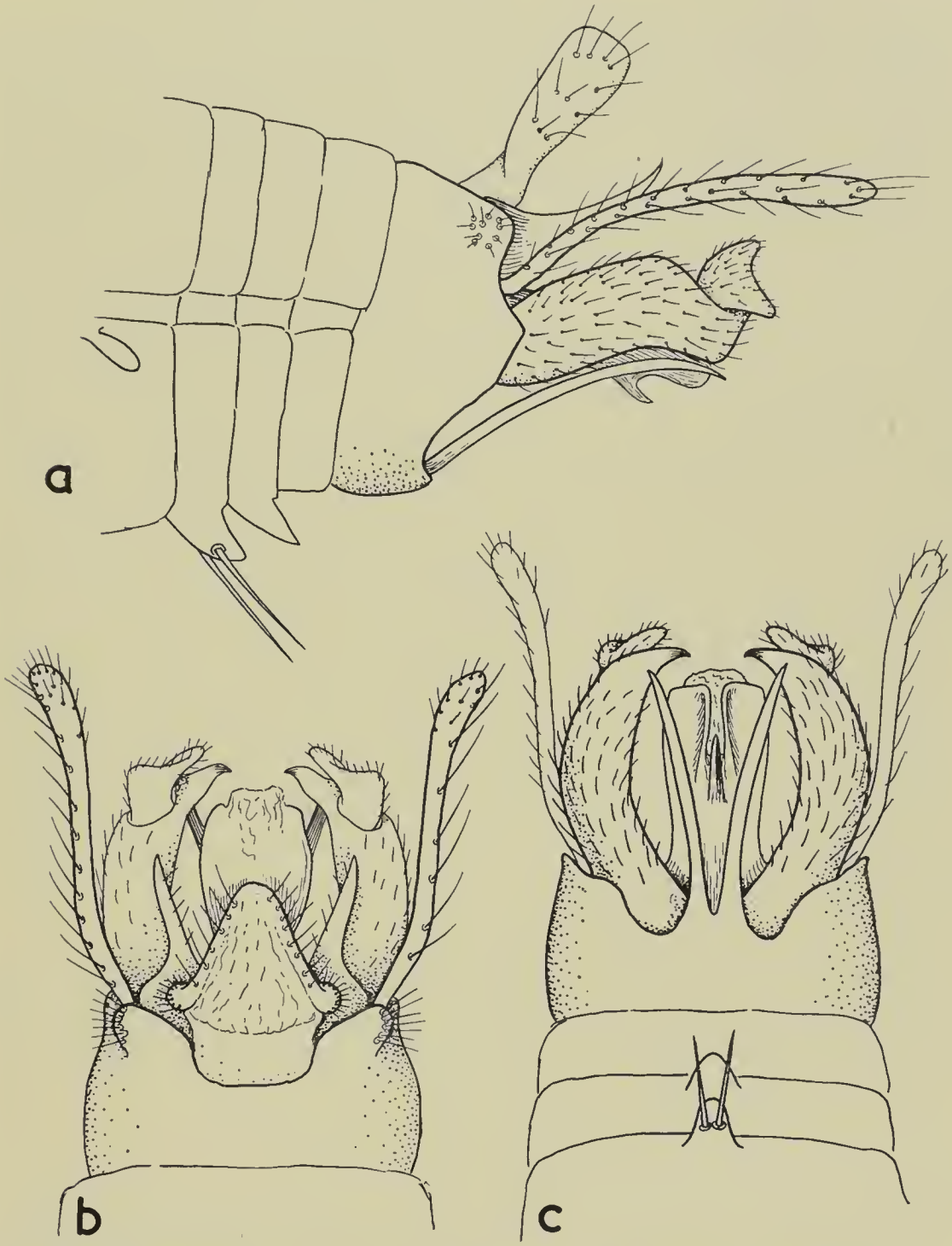

FIG. 310.—*Anachorema seona* sp. n. ♂ genitalia. *a*, lateral; *b*, dorsal; *c*, ventral (dorsal plate and upper penis-cover omitted).

Anachorema evansi sp. n. (figs. 311, 312).

Insect brownish. *Neuration* as figured. Basal joint of the *antenna* swollen and convex above ; second joint rather shorter than each of the other joints. *Spurs* 2, 4, 4.

Genitalia, ♂.—There is a semi-membranous dorsal plate, of which the lower lateral margins are produced in short, slender, finger-like processes, apices fringed. From the side, the distal margin of the ninth segment is strongly concave with a rounded projection towards the upper angle, which forms an acute triangle, its outer margin produced downward to form a plate with concave distal margin ; this plate is produced at its lower angle in a medium-sized process with a constricted stem and dilated apex, which lies below the upper penis-cover. The lower margin of the segment, from the side, forms a strong hook, rather broad and bearing on its upper surface, just before the apex, a triangular process with bifurcate apical angle. From beneath, the margin is produced at its centre and narrowed to a bifurcate and slightly inturned apex. Upper penis-cover is asymmetric, one side bearing a long, sinuate spine, both sides furnished with long teeth which cross one another. Superior appendages long, slender, ascending slightly to a dilated, fringed apex. Penis stout with asymmetric sheaths, one of which curls as a twisted spine from the base. Inferior appendages two-jointed ; basal joint long and stout, terminating in a short, swollen, inturned claw, terminal joint reduced to a short, stout claw opposing that of the basal segment. A lateral filament arises from the centre of the upper lateral margin of the fifth sternite, directed upward, reduced from about midway to a slender filament ; a ventral process to the seventh sternite.

Genitalia, ♀.—From above, the abdomen terminates in a large, triangular plate ; from beneath can be seen two narrow lateral plates, between which is the tubular ovipositor with fringed apical margin. The lateral margins of the fifth sternite towards their bases are produced in small rounded processes. No ventral process.

In both sexes the dorsal surface of the abdomen is patterned with circular pigmented discs.

Length of anterior wings, ♂ and ♀, 5 mm.

Tasmania : 1 ♂, 5 ♀, J. W. Evans.

Type, ♂, mounted as a microscope preparation.

This species differs from the foregoing species in its spur-formula (2, 4, 4), the much-reduced production of the ventral margin of the ninth segment of the ♂, and the stalked fork no. 1 in the posterior wing.

Synchorema Tillyard.

Synchorema Tillyard, 1924, *Trans. N. Zeal. Inst.*, 55 : 296–297, text-fig. 11.

Tillyard describes the genus as follows :

" Closely allied to *Hydrochorema*, with which it agrees in the important characters of the general shape of the wings, the absence of Af_1 in hindwing, and the general

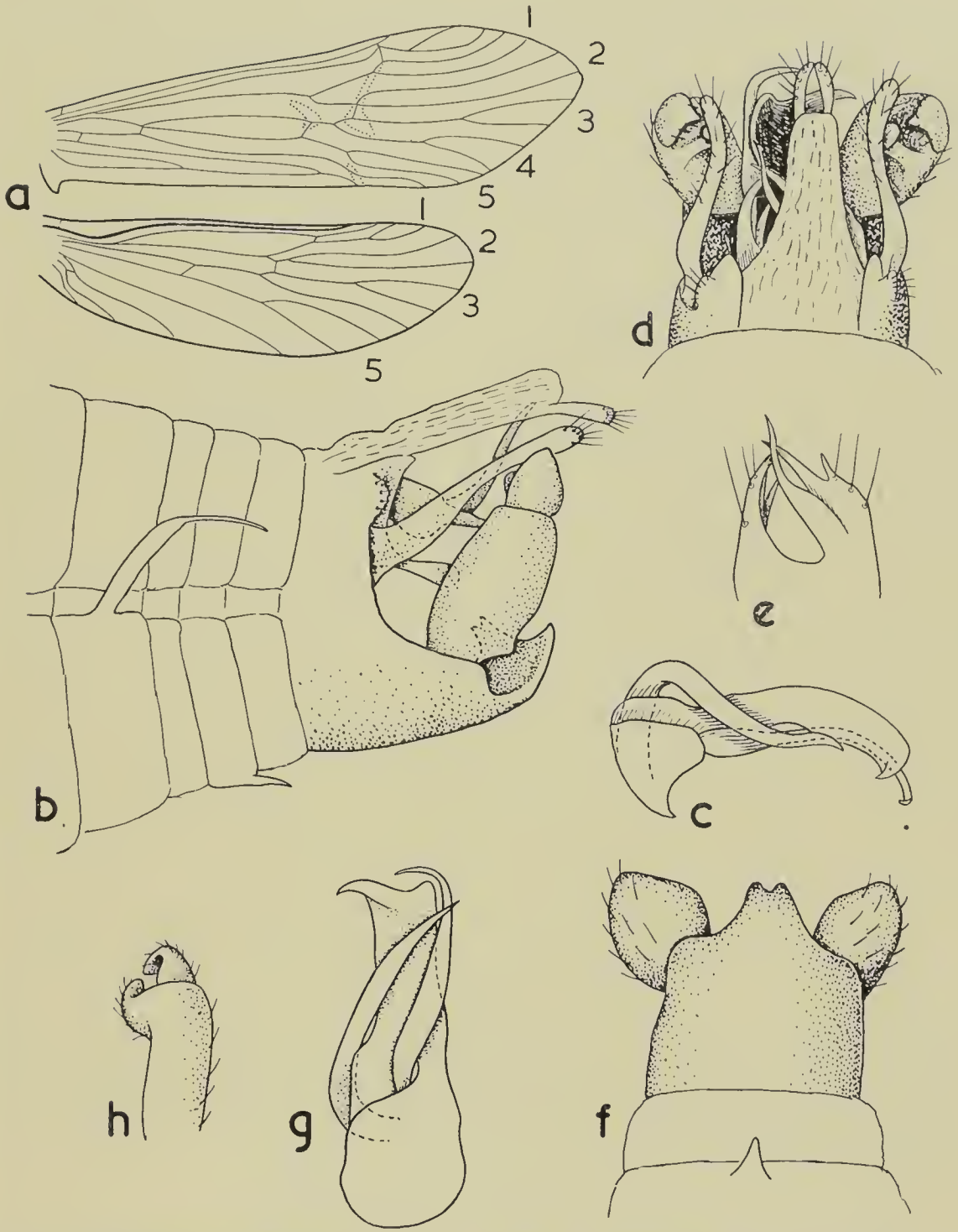

FIG. 311.—*Anachorema evansi* sp. n. ♂. *a*, wings; *b*, genitalia, lateral (penis and sheaths omitted); *c*, penis and sheaths, lateral; *d*, genitalia, dorsal; *e*, upper penis-cover, dorsal; *f*, inferior appendages, ventral; *g*, penis and sheaths, ventral; *h*, inferior appendage from behind.

form of the median and cubital apical forks, but differing from it in the following important points: Hindwing with main stem of R_1 atrophied [not constant.—D. E. K.], but with Sc well developed, and running close to costa for three-fourths of its length. In both wings Af_2 appears to be stalked; but there is a small cell present, attached distally to radial cell in forewing, and occupying angle between R_{2+3} and R_{4+5} at their origins in hindwing, and inside this cell can be seen the wing-spot. This shows clearly that in both wings R_4 and R_5 have become secondarily fused together for a considerable distance, thus shortening the fork Af_2 and making it appear stalked, but leaving the wing-spot, which always occurs in angle between R_4 and R_5 in secondary cell formed by this fusion. This formation is unique, so far as I know, in

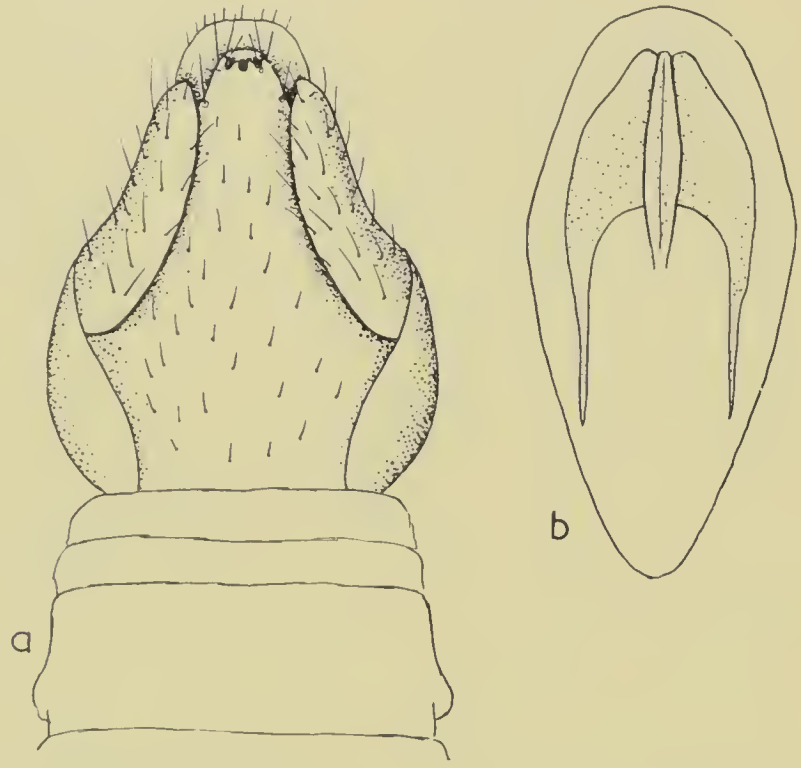

Fig. 2.—*Anachorema evansi* sp. n. ♀. *a*, genitalia, ventral; *b*, vaginal structure, ventral (more enlarged).

the order but may profitably be compared with that found in forewing of *Psilochorema*, where a secondary cell has been formed by development of an extra cross-vein, so as to enclose within it the wing-spot as shown in fig. 313. In the latter case it will be noted that no fusion of R_4 with R_5 has taken place. Tibial spurs 2, 4, 4. Appendages of the male very short."

Type species.—*Synchorema zygoneura* Tillyard, 1924.

Key to Species of *Synchorema*, Males.

1. Inferior appendage from side with a deep excision of the upper margin beyond the middle . . . . . *S. zygoneura* Tillyard (p. 464).
. Inferior appendage with the upper margin not excised *S. zelandica* sp. n. (p. 464).

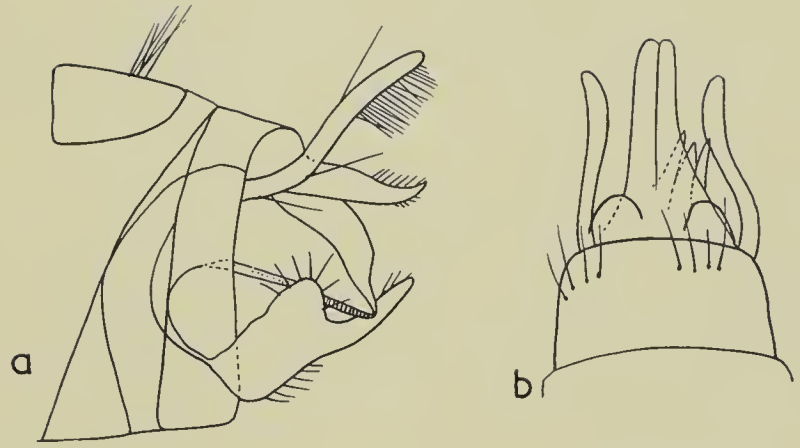

FIG. 313.—*Synchorema zygoneura* Tillyard. ♂ genitalia (after Tillyard). *a*, lateral ; *b*, dorsal.

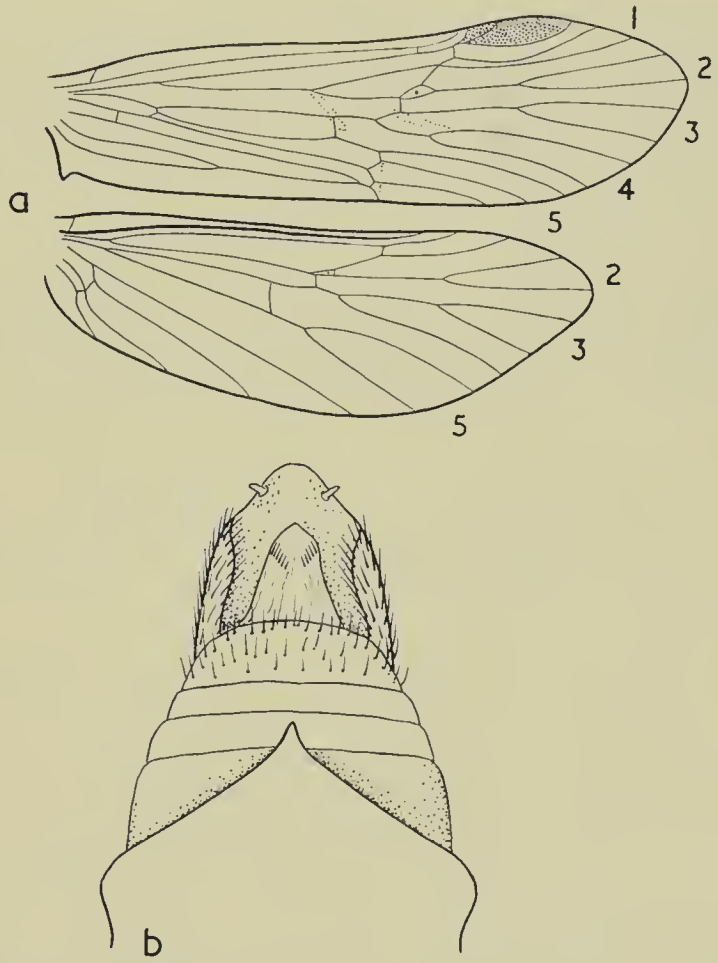

FIG. 314.—*Synchorema zygoneura* Tillyard. ♀. *a*, wings ; *b*, genitalia, ventral.

Synchorema zygoneura Tillyard (figs. 313, 314).

Synchorema zygoneura Tillyard, 1924, *Trans. N. Zeal. Inst.*, 55 : 297–298, pl. 19, fig. 7, text-figs. 11, 12.

Tillyard describes the species as follows :

" ♂. Total length, 4 mm. ; forewing, 6·7 mm. ; expanse, 14 mm."

" *Head, thorax* and *abdomen* brownish : eyes black : antennae and legs pale testaceous."

" *Wings.*—Forewing semitransparent subfulvous, with numerous short upright golden-brown hairs ; pterostigma darker, brownish ; venation brownish ; fringe of pale-brownish hairs of moderate length. Hindwing hyaline, iridescent, with a fringe of short dark-brown hair very closely set above the apex of wing but with longer and paler hairs, less closely set, around termen and posterior margin ; venation brown."

"Appendages very short, as shown in fig. 314 ; in the dried specimens they are sometimes scarcely to be discerned, except for the two slender and slightly clubbed pre-anal appendages."

" Female closely resembling male, but larger (expanse 16·5 mm.), and usually with forewings somewhat brighter in colour."

" *Types.* Holotype male, Mount Arthur, 4500 ft. (23rd December, 1921, A. Philpott). Allotype female, Arthur's Pass, 2800 ft. (19th January, 1920, R. J. T.). Also other males from Nelson (6th January, 1921, A. Philpott), Gouland Downs (7th February, 1922, R. J. T.), and females from Arthur's Pass (19th January, 1920, R. J. T.) and Queenstown (14th December, 1919, R. J. T.), all in the Cawthron Institute Collection."

" *Habitat.*—South Island of New Zealand : Rare."

To this I add :

Genitalia, ♀.—Abdomen terminating in a blunt, triangular hood which extends round the sides in rounded lobes ; a short, acute process to the fifth sternite is the point of juncture of two strong, lateral ridges.

Synchorema zelandica sp. n. (fig. 315).

Insect rather small, ochraceous. *Head* dark ochraceous with honey-coloured hairs. Oculi dark brown, nearly black. *Antennae, palpi, legs* rather paler than the head. *Wings* ochraceous with widely scattered, semi-recumbent hairs.

Genitalia, ♂.—Dorsal plate rather short, upturned strongly at right angles. Superior appendages moderately long and stout. Upper penis-cover in the form of a pair of plates, seen from the side the upper angle produced and pointed, directed distally. Between the cover and the superior appendages is a rounded wart. Penis straight, apex obliquely truncate. Lower penis-cover bifurcate, with a bunch of long hairs arising from its upper surface near the base ; lateral margins towards the apex somewhat elevated. Inferior appendages large, upturned, rather slender ; outer margins with a round dilatation somewhat concealed within the segment, near the base, as seen from beneath. Lateral filaments of the fifth segment stout, apices slightly clavate.

Length of the anterior wing, ♂, 7 mm.

New Zealand : Queenstown, 14.xii.1919, 1 ♂, R. J. Tillyard.

This species closely resembles *S. zygoneura* Tillyard, and is probably the example mentioned as from Queenstown under the description of that species. It differs in the form of the ♂ genitalia.

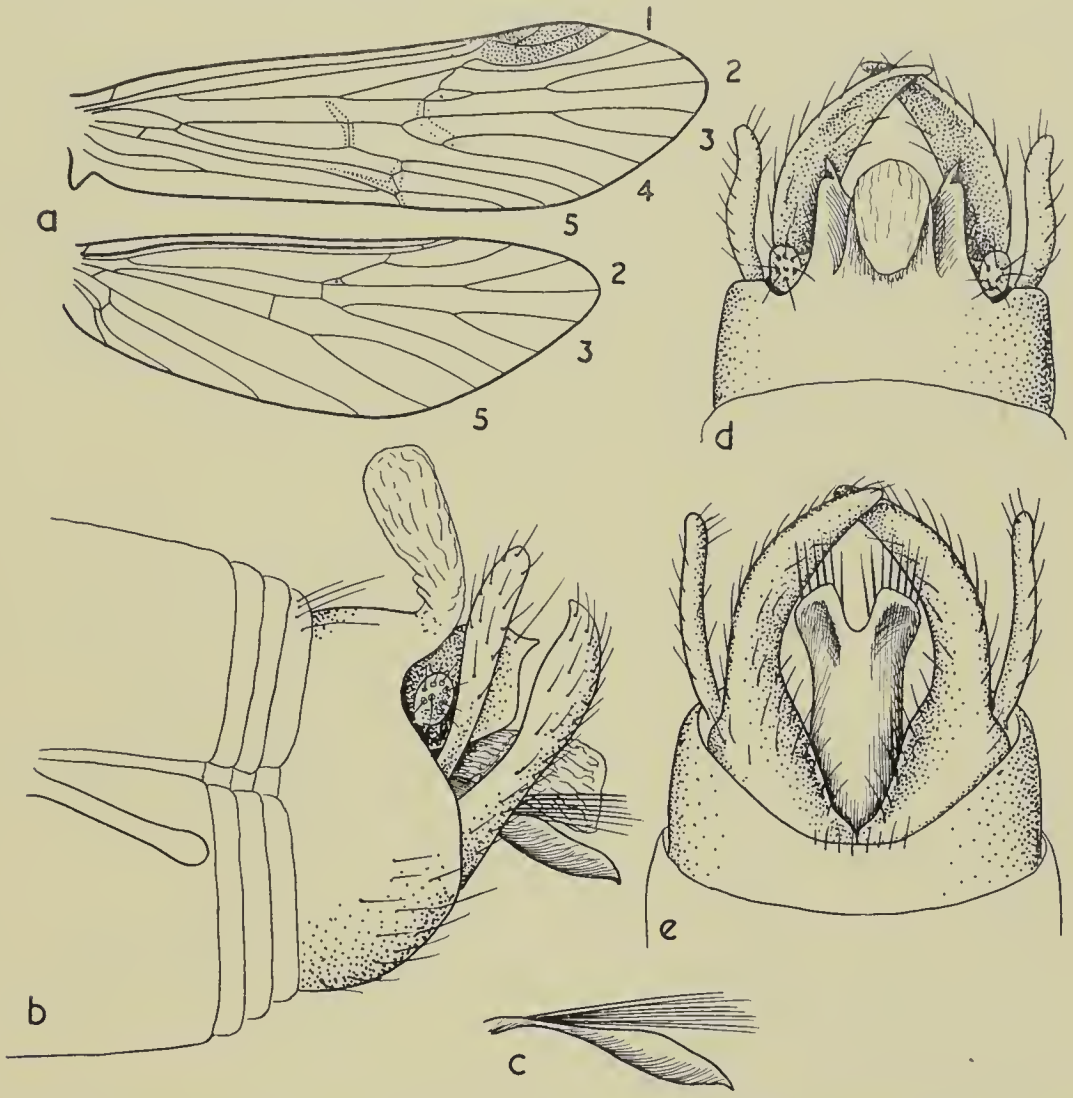

Fig. 315.—*Synchorema zelandiea* sp. n. ♂. *a*, wings ; *b*, genitalia, lateral ; *c*, lower penis-cover, lateral ; *d*, genitalia, dorsal ; *e*, ventral.

Neurochorema Tillyard.

Neuroehorema Tillyard, 1924, *Trans. N. Zeal. Inst.*, 55 : 290–291, text-figs. 5, 6.

Tillyard describes the genus as follows :

"A very distinct genus, differing from all other New Zealand representatives of the family by the great dissimilarity in the venation of the wings in the two sexes, and also by the absence of the first apical fork, and the incompleteness of R_1 basally.

in the hindwing. Wings considerably broader in male than in female : in the latter, Sc. at about half-way in both wings, approaches very close to the costal border, and runs in contact with it from there on to its termination. Pterostigma of forewing very large, with R_1 running through it. In both sexes, forewing has all five apical forks present, but the hindwing has only Af_2, Af_3 and Af_5. The correct naming of the veins in the male is only possible by comparison with those of the female, when it will at once be seen that, in the forewing, M_2 and M_3 have partially coalesced in the male, so as to produce an *apparent* fork between them distally, whereas the true apical forks, Af_3 and Af_4, lie one above and one below this apparent fork respectively. The branches of the cubitus and the end of 1A are also abnormally developed in the male, and 1A takes much the same position distally that Cu_2 does in the female, as can be seen in fig. 316. In the hindwing the male shows very high specializations, a wide closed cell being formed below the distal end of Sc ; this cell is bounded by R_{2+3} basally, R_{1-3} above, R_{4+5} below, and by a cross-vein distally. M_2 has become fused basally with M_{3+4} in the same manner as with M_3 in forewing. Cu_2 has become bent and fused for a short distance with 1A, which is also bent, and there is a strong cross-vein connecting Cu_2 with the fork of Cu_1. Tibial spurs, 2, 4, 4. Abdomen of female not produced into an elongated ovipositor."

Type species.—*Neurochorema decussatum* Tillyard, 1924 (= *Psilochorema confusum* McLachlan, 1868).

Key to Species of *Neurochorema*, Males.

1. Inferior appendage shorter than superior appendage, without a flange or keel along inner surface . . . . . *N. confusum* (McLachlan) (p. 466).
–. Inferior appendage as long as superior, from beneath with a flange or keel along inner surface for about the basal three-quarters *N. armstrongi* McFarlane* (p. 544).

Neurochorema confusum McLachlan (figs. 316, 317).

Psilochorema confusum McLachlan, 1868, *Journ. Linn. Soc. Lond.*, **10** : 210–211, 214, pl. 2, fig. 10, *a*, *b*.
Psilochorema confusum McLachlan, 1873, *Ann. Mag. Nat. Hist.*, (4) **12** : 42.
Psilochorema confusum Hutton, 1899, *Trans. N. Zeal. Inst.*, **31** : 248.
Psilochorema confusum Hudson, 1904, *N. Zealand Neur.* : 89.
Psilochorema confusum Ulmer, 1907, *Gen. Insect.*, **60a** : 204.
Psilochorema confusum Tillyard, 1924, *Trans. N. Zeal. Inst.*, **55** : 288, fig. 2.
Neurochorema decussatum Tillyard, 1924, *Trans. N. Zeal. Inst.*, **55** : 291–292, pl. 19, figs. 3, 4, text-figs. 5–7.
Neurochorema decussatum McFarlane, 1939, *Trans. Proc. R. Soc. N.Z.*, **69** : 330.

McLachlan describes the species as follows :

" Long. corp. 2‴ ; exp. alar. 7‴."

" *Head—antennae* yellow, very indistinctly annulated with fuscous : basal joint with golden-yellow hairs ; *vertex* testaceous, fuscous, thickly clothed with golden-yellow hairs ; *palpi* fuscous ; *ocelli* yellow."

" *Thorax—prothorax* indistinct, clothed with golden-yellow hairs ; *meso-* and *metathorax* fuscous (the hairy clothing is rubbed off in my example)."

" *Wings—anterior wings* pale-brown, with pale-yellow woolly clothing, mixed with black, especially on the cubitus ; an indistinct, whitish, wavy transverse fascia before the apex, and some markings on the disk (this pale fascia and markings

* See Appendix.

are not caused by the clothing of the wings, but are pale spaces in the membrane itself) ; fringes pale golden-brown ; pterostigma elongate, darker ; neuration extremely irregular and aberrant in the ♂ in both pairs of wings, regular in the ♀

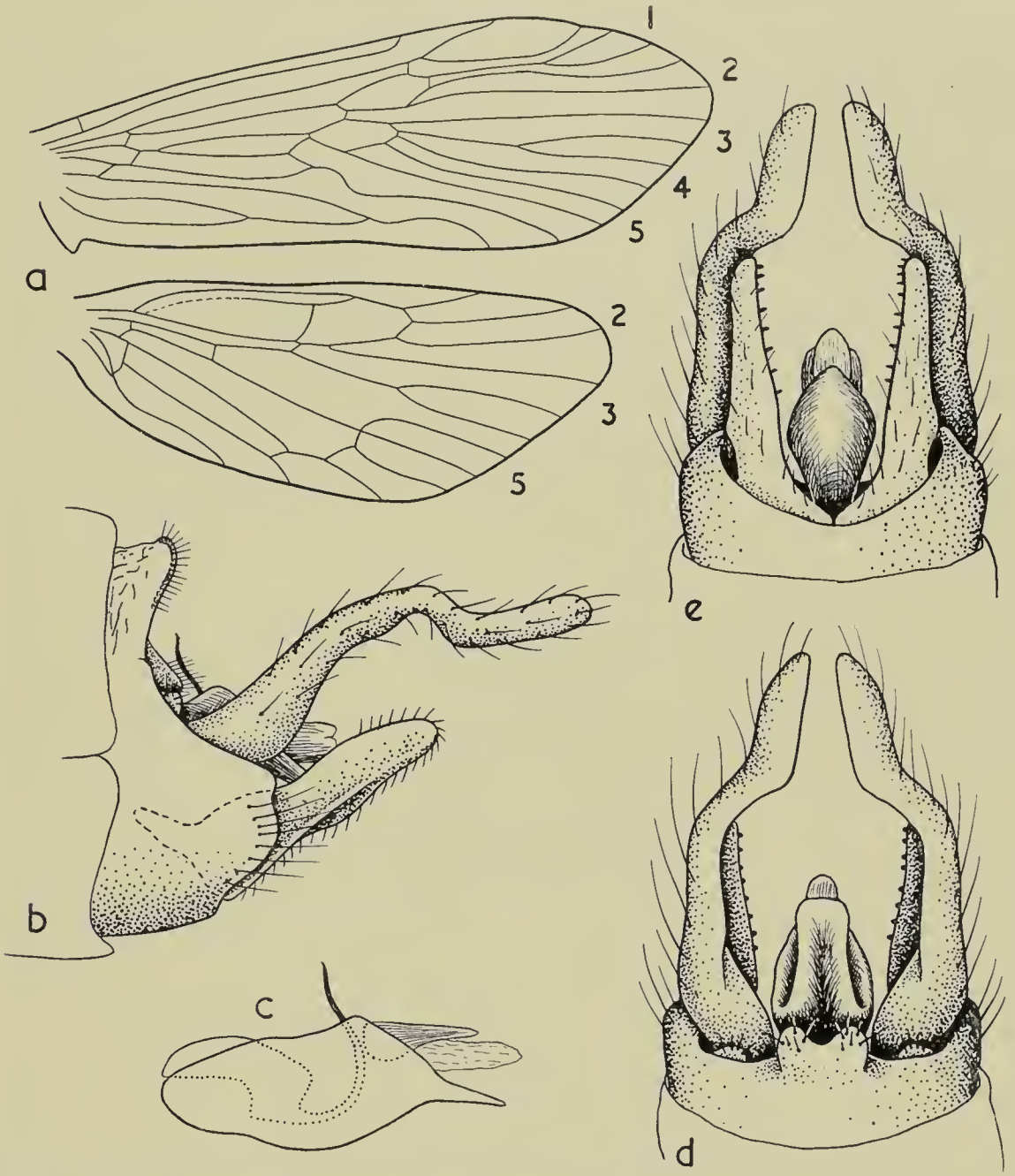

FIG. 316.—*Neurochorema confusum* (McLachlan). ♂. *a*, wings ; *b*, genitalia, lateral *c*, penis, etc., lateral ; *d*, genitalia, dorsal ; *e*, ventral.

(I despair of being able to draw up an intelligible description of the veining of the wings of the ♂, and refer the reader to the figures on pl. II, fig. 10 ; the discoidal cell is there represented as closed by a dotted line ; there is little doubt that the

veinlet closing this cell is really present, but I have not been able to see it very clearly ; it is certainly very fine) ; *posterior wing* smoky grey, subhyaline, iridescent ; fringes grey."

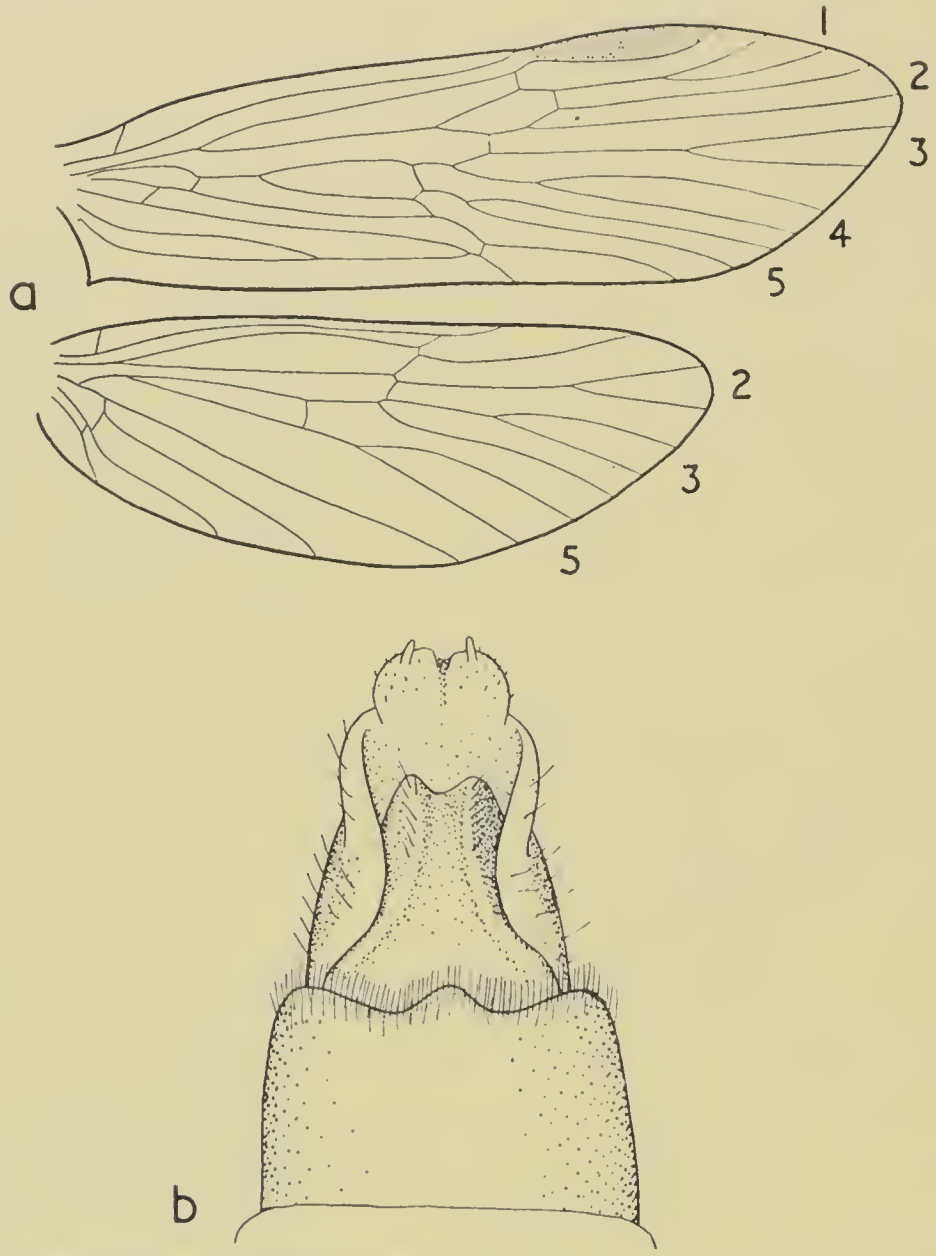

FIG. 317.—*Neurochorema confusum* (McLachlan). ♀. *a*, wings ; *b*, genitalia, ventral

" *Legs* pale-yellow ; anterior and intermediate tibiae and tarsi, especially in the ♀, somewhat fuscescent externally."

" *Abdomen* fuscous ; the apical margin of each ventral segment broadly dingy-yellowish ; appendices yellow."

McLachlan then describes the genitalia, but as the figures given in the present work have been drawn from cleared material, it is desirable to describe these parts afresh.

Genitalia, ♂.—The apical margin of the ninth tergite is lightly chitinized, and produced at its centre in a lobe with roundly excised apical margin and with a sparsely fringed distal margin. Superior appendages (app. inf. of McLachlan) very long, bent inwards towards the apex. There are upper and lower penis-covers, both trough-shaped. Penis membranous, with a single spine arising from the base and curving sinuously upward. Inferior appendages (the two valve-like lower sheaths of McLachlan) reaching as far as the bend of the superior appendages, armed with short, black teeth along the inner margin, with a small, triangular, basally directed process, arising from the upper surface near the base, only visible in a balsam preparation. Eighth sternite, from the side, projecting slightly to make an apparent ventral process.

Genitalia, ♀.—Apex of the abdomen bluntly triangular ; terminal segment with the apical margin slightly excised, with a pair of small processes arising from the margin at the apex. There is a pair of conspicuous lateral plates. Apical margin of the seventh sternite fringed and slightly produced at its centre to make a short process when seen from the side.

The description and figures of the female have been made from an example in the British Museum (N.H.) labelled New Zealand : Tokaanu, 27.ii.19, from the Tillyard Collection. McLachlan's *types* are from New Zealand : Auckland (Edwards), no date, 1 ♂, 1 ♀, and are now in the British Museum (N.H.).

McLachlan placed this species in the genus *Psilochorema*, other authors following him in this. The neuration, however, differs widely from that of the type species, *mimicum*, and the species fits better into Tillyard's *Neurochorema*, which was erected to take this species under the name *decussatum* Till. This has been independently pointed out by McFarlane in his account of the New Zealand Rhyacophilidae.

Of the habits of this species, Hudson writes :

" In its metamorphosis this species closely resembles *H. umbripennis* ; the larva is, however, much smaller, with the head proportionately narrow. The inner cocoon is more transparent and much smaller ; the outer cocoon is also smaller. I have observed that the larva remains in its cocoon for many days before manifesting any change."

" The perfect insect appears from November till March, and is much attracted to light. It is commonest about midsummer."

Neurochorema armstrongi McFarlane.

(See Appendix, p. 544.)

Hydrochorema Tillyard.

Hydrochorema Tillyard, 1924, *Trans. N. Zeal. Inst.*, 55 : 292.

Anal area of *fore wing* with both 2A and 3A well developed, the former joining 1A at the bend of Cu_2, just below point where Cu_1 forks, and the latter extending a little beyond half-way from base to this point. Pterostigma of

fore wing well developed, with R_1 running through it as a loop. Sc running alongside or fused with R_1 in fore wing, separate from it in hind wing, but very short, ending up before half-way along costa. *Hind wing* with apical fork no. 2 apparently forked, but position of wing-spot, placed apparently in angle between R_{2+3} and R_{4+5} at their origins, would appear to indicate that there has been a suppression of the extra cell described in *Synchorema* ; thus *Hydrochorema* shows a more highly evolved state of the radial sector in hind wing than does *Synchorema*, though the same region remains more primitive in fore wing. General shape of wings rather long and slender, the fore wing gradually widening from base outwards to end of pterostigma, and then narrowing quickly to form a bluntly pointed apex on R_5. Hind wing with apex at R_5, but practically in line with costa. *Tibial* spurs 2, 4, 4. Male with long, foreipate inferior appendages.

Type species.—*Hydrochorema crassicaudatum* Tillyard, 1924.

Allied to *Hydrobiosis*, but differing in the absence of fork no. 1 in the hind wing. Forks nos. 1 and 2 of fore wing are sessile on the closed discoidal cell, whereas *Hydrobiosis* has fork no. 1 sessile but fork no. 2 stalked. It also resembles *Hydrobiosis* in the form of the two median forks, fork no. 4 being a long fork with a short stalk, fork no. 3 a somewhat shorter fork with a stalk about as long as the fork itself.

KEY TO SPECIES OF *Hydrochorema*, MALES.

1. Inferior appendage from side with apex clavate *H. crassicaudatum* Tillyard (p. 470).
–. Inferior appendage with apex slender, not dilated *H. tenuicaudatum* Tillyard (p. 472).

Hydrochorema crassicaudatum Tillyard (fig. 318).

Hydrochorema crassicaudatum Tillyard, 1924, *Trans. N. Zeal. Inst.*, 55 : 293–294, pl. 19, fig. 5, text-figs. 8, 9*b*.

Insect of moderate size, brownish. *Head* dark ochraceous, clothed with dark and pale ochraceous hairs. Oculi black. *Antennae* with the basal joint large, clothed with pale honey-coloured hairs and darker than the remaining joints. *Palpi* and *legs* dark ochraceous. *Wings* dark ochraceous, *anterior* with a distinct yellowish patch in the disk with six or seven darkish, indistinct spots towards the border giving this area a darker appearance. Fringes dark ochraceous. In the postcostal area are three black, equidistant spots situated towards the basal half of the wing.

Genitalia, ♂.—Dorsal plate strongly chitinized, tapering to a narrow, truncate apex. Superior appendages narrow, only slightly shorter than the dorsal plate with a minute wart situated above the base. Upper penis-cover in the form of a pair of serrate hooks, apices directed upward, with strong shoulders on the outer margins ; lower penis-cover (or perhaps penis-sheaths) broad, terminating in downturned hooks with dense brushes of hair on their inner surfaces towards the base of the hooks. Penis, or its duct, a fine spine directed upwards. Inferior appendages long, considerably dilated at the apices, as seen from the side, and with shelf-like plates projecting, one on the lower margin near the apex and the other on the upper margin near the base.

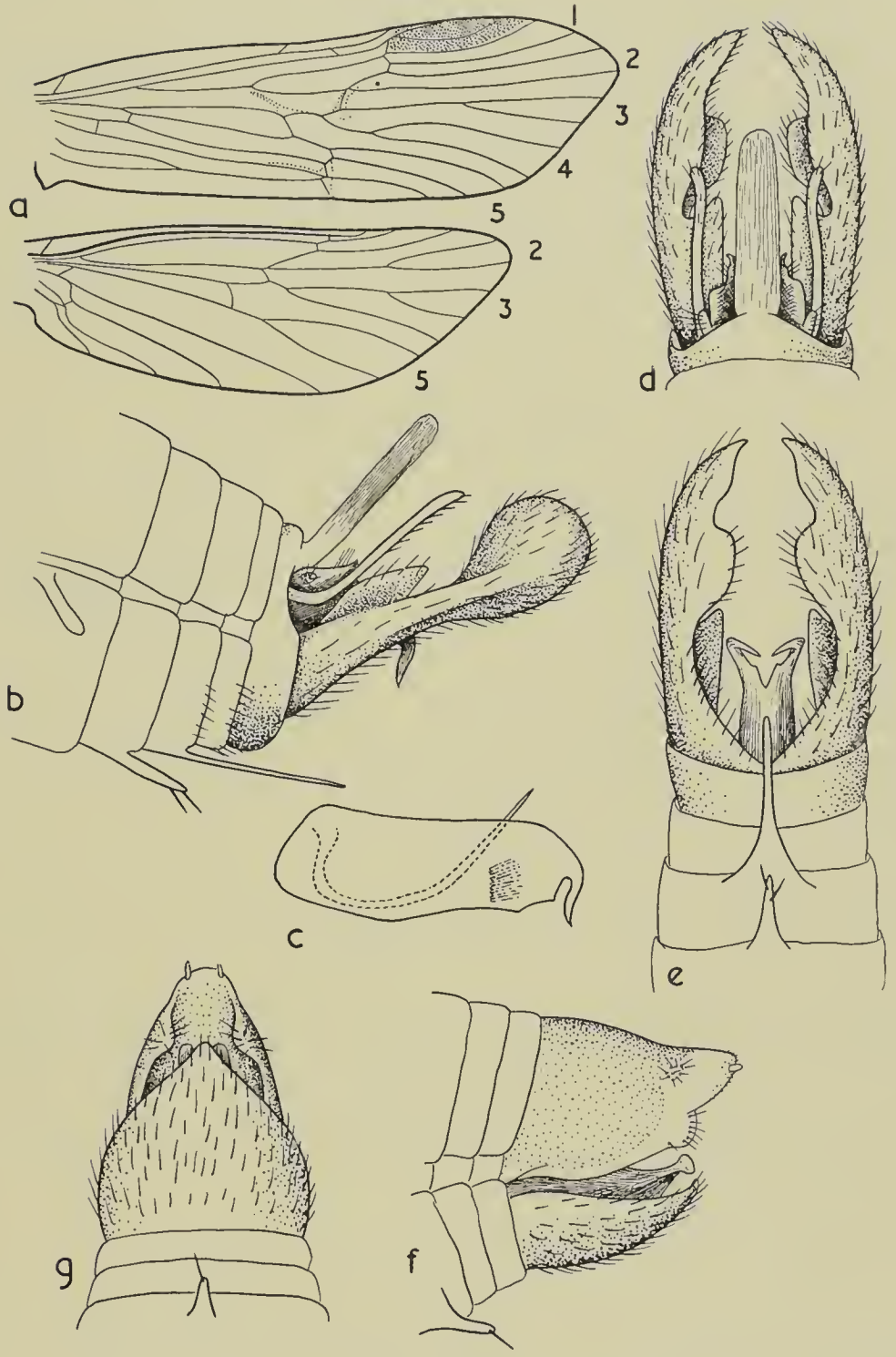

FIG. 318.—*Hydrochorema crassicaudatum* Tillyard. *a*, ♀ wings ; *b*, ♂ genitalia, lateral ; *c*, penis, lower penis-cover, lateral ; *d*, ♂ genitalia, dorsal ; *e*, ♂ inferior appendages, lower penis-cover, ventral ; *f*, ♀ genitalia, lateral ; *g*, ventral.

this latter forming a distally directed hook. A long, slender process to the seventh and a smaller to the sixth sternite. Lateral filaments of the fifth segment short and thick.

Genitalia, ♀.—The abdomen terminates in a triangular dorsal plate. Ventrally there is a triangular plate, and between this and the dorsal plate is a pair of processes with clavate apices and other obscure structures. Ventral process to the fifth segment.

Length of the anterior wing, ♂, 6·5 mm.; ♀, 6 mm.

Holotype. ♂, NEW ZEALAND: Nelson (15th December, 1921, A. Philpott), in the Cawthron Institute Collection. Other males from Takaka and Rotorua,

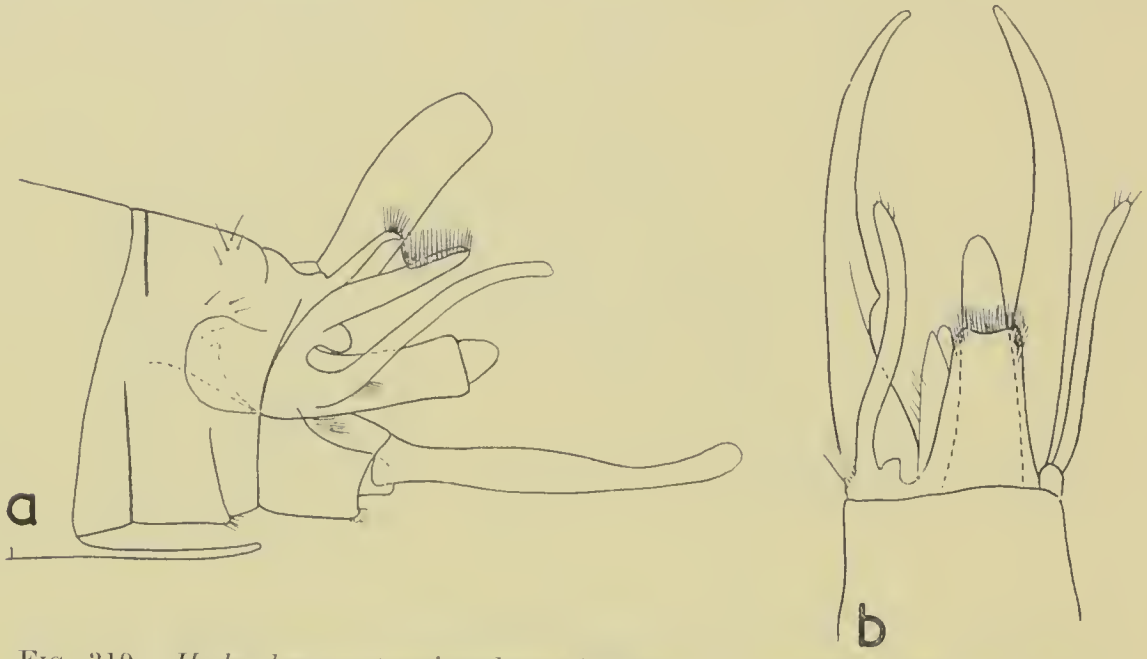

FIG. 319.—*Hydrochorema tenuicaudatum* Tillyard. ♂ genitalia (after Tillyard). *a*, lateral; *b*, dorsal.

North Island. Examples collected by Mr. G. V. Hudson in the Wellington district have been presented to the British Museum (N.H.) by the collector.

Hydrochorema tenuicaudatum Tillyard (fig. 319).

Hydrochorema tenuicaudatum Tillyard, 1924, *Trans. N. Zeal. Inst.*, **55**: 295–296, pl. 19, fig. 6, text-figs. 9*a*, 10*b*.

Tillyard describes the species as follows:

"♀. Total length, 6 mm.; forewing, 10·5 mm.; expanse, 22 mm."

"*Head*, *thorax*, and *abdomen* blackish-brown; eyes dull-blackish: antennae about as long as forewing, brown, annulated with darker brown on every segment. Legs entirely pale-testaceous."

"*Wings*.—Forewing blackish-fuscous, with few very short upstanding yellowish-brown hairs; pterostigma not very distinct; termen with very distinct row of golden-brown spots and very short fringe of brownish hairs; a suggestion of parallel

row of spots from end of stigma down to behind tornus, but due only to small groups of golden-brown hairs. Hindwing subhyaline, iridescent, with dark-brown veins and short fringes of brown hairs."

" ♂. Differs from female in being of somewhat smaller size and with somewhat narrower wings, the forewings very dark, almost black. Appendages as shown in fig. 319 ; gonopophyses forming an elongated slender forceps, which is diagnostic of the species in the dried specimen. Only sternite 8 with a projecting spine."

" *Types.*—Holotype female and allotype male, Mount Arthur, 4000 ft. (28th February, 1921), taken by Mr. A. Philpott ; both in the Cawthron Institute Collection. Both specimens were in perfect condition, but the male has since been badly damaged by an accident so the female has been made the holotype."

" *Habitat.*—[New Zealand :] Nelson Province, Mount Arthur is the only locality for the insect, so far as known."

Costachorema McFarlane.

Costachorema McFarlane, 1939, *Trans. Proc. R. Soc. N.Z.*, **69** : 335.

Allied to *Tiphobiosis* Tillyard. *Antennae* long and slender, basal joint large, globular. Joints of the *palpi* slender. *Anterior wing* with forks nos. 1, 2, 3, 4 and 5 present. Costa folded over the sub-costa to varying degrees in the different species in the ♂ sex only. Sub-costa much bent at its base, very short and joining the radius nearer the base than the apex of the wing in the ♂. Discoidal and median cells open. *Posterior wing* with forks nos. 1, 2, 3 and 5. Discoidal cell open. Sub-costa considerably bent at its base. Costa and sub-costa normal in the ♀. *Spurs* 2, 4, 4, those of the anterior leg very small.

Type species.—*Costachorema psaroptera* McFarlane, 1939.

The genus differs from *Tiphobiosis* in the posterior wing in which fork no. 3 is present in *Costachorema* but absent in *Tiphobiosis*. The genitalia in the two genera differ widely, particularly in the form of the inferior appendages.

Key to Species of *Costachorema*, Males.

1. No ventral process . . . . . *C. callistum* McFarlane (p. 473).
–. Ventral process to the seventh segment . . . . . 2.
2. Wings (when at rest) not extending beyond the apex of the abdomen *C. brachyptera* McFarlane (p. 475).
–. Wings extending beyond apex of abdomen . . . . . 3.
3. Terminal joint of inferior appendages much shorter than basal joint *C. xanthoptera* McFarlane (p. 477).
–. Terminal joint of inferior appendages at least half as long as basal joint *C. psaroptera* McFarlane (p. 478).

Costachorema callistum McFarlane (fig. 320).

Costachorema callistum McFarlane, 1939, *Trans. Proc. R. Soc. N.Z.*, **69** : 337–338, figs. 23, 24.

I am unacquainted with this species, which McFarlane describes as follows :

" This insect resembles *C. psaroptera* in general proportions, but is readily distinguishable by its warmer wing colouring, with a reddish tinge along the posterior margin of the forewing, by the lesser contrast between colour of body and hairy

covering, and by the distinct annulations of the antennae, which are visible to the naked eye."

"Expanse : 24 mm. ♂."

"Head brown, vertex clothed with black hairs interspersed with yellow ; frons covered less densely than *C. psaroptera*, with short yellow and black hairs : max. palpi grey, finely pubescent ; labial palpi lighter, short : antennae strongly ringed, fuscous and yellowish-brown ; eyes large, dark : ocelli white."

"Prothorax inconspicuous, with long upstanding hairs similar to those on tegulae and mesothorax ; legs yellowish-brown proximally, posterior pair with darker bands on tarsi : middle and forelegs strongly banded yellow and dark fuscous on tibiae and tarsi : spurs 2, 4, 4, anterior very small. Wings as for genus, outline like *C. psaroptera* ; but termen not concave. Sc returns to R_1 opposite point of bifurcation of Rs ; fold in costal margin, narrow, not covering Sc ; dense black fringe proximally on costal margin ; wing membrane clothed more densely and with

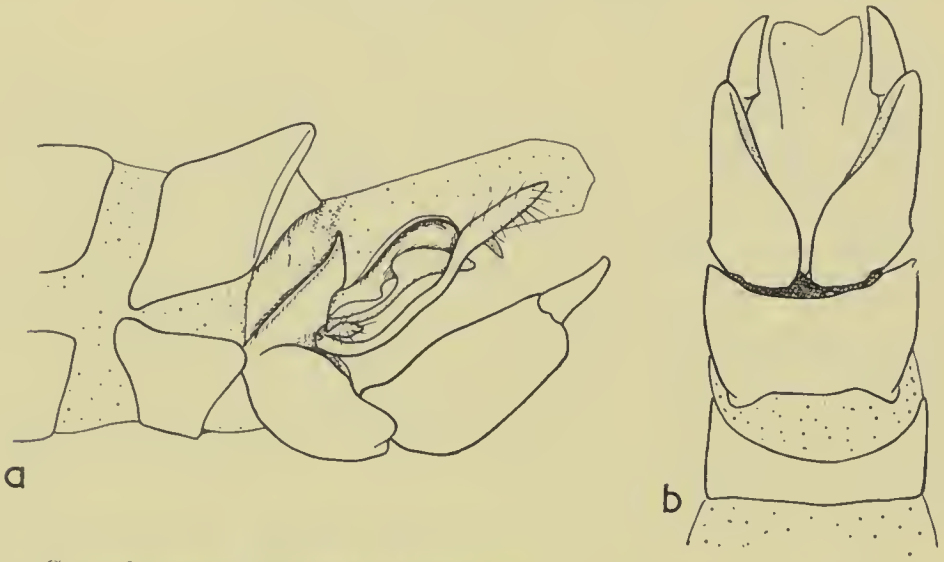

FIG. 320.—*Costachorema callistum* McFarlane. ♂ genitalia (after McFarlane). *a*, lateral (aedeagus omitted) ; *b*, ventral (aedeagus and other appendages omitted, tip of proctiger showing).

longer hair than in *C. psaroptera* ; white hair of the latter replaced by golden ; a tuft of black upstanding hair on A_2 between its points of contact with A_3 and A_1 : in the cubital region, particularly distally, wine red hair forms the greater part of the wing covering ; hindwings hyaline with fuscous fringes."

"Abdomen light reddish-brown above, pale yellowish-brown below ; hair, dorsally, fine, light, sparse ; on terminal tergite, long, golden ; no ventral teeth ; penultimate sternite much shorter mid-ventrally than laterally ; ultimate sternite extending laterally above the plural region ; the eighth segment is produced dorsally to a blunt projection ; from beneath the sides of this a pair of lightly chitinised triangular plates project ; the proctiger is stout, and hides from view the superior app. [upper penis-cover.—D. E. K.] and aedeagus ; sup. app. [upper penis-cover.—D. E. K.] brown, spoon-shaped, the concave surface of the spoon opening downwards, the convex fitting into a depression in the soft proctiger ; just posterior to the sup. app., a pair of triangular flaps project from the ventral surface of the proctiger ; intermed. [superior.—D. E .K.] app. curved and enlarged distally, directed upwards ;

inf. app. broad in the basal joint, short and dark brown in the terminal joint ; both joints concave on the inner surface ; aedeagus brown, strongly chitinised, with three appendages terminally, two of which are hooked to point downwards ; a long paramere with a slender stem and a broad flat terminal portion is bent up to lie lateral, and adjacent to the sup. app. [upper penis-cover.—D. E. K.]."

" Holotype : unique male ; in Canterbury Museum ; abdomen in balsam. The larva of this species is known to me. The adult probably emerges in the autumn, judging from the condition of the larvae collected in mid-summer.

" Habitat : Broken River and Cragieburn River, above West Coast road, and Mount Baldy, Cass, at 2600 ft. [New Zealand]. Cold, stony, streams, unstable substratum."

Costachorema brachyptera McFarlane (fig. 321).

Costachorema brachyptera McFarlane, 1939, *Trans. Proc. R. Soc. N.Z.*, **69** : 338–339, figs. 3, 25, 26, 27.

I am unacquainted with this species, which McFarlane describes as follows :

"A very robust insect, almost black in colour when fresh. Wing abnormality appears to be the rule. Only three females out of a collection of a score of this species are winged genotypically as to shape and size. Expanses of six females were 23, 25, 28, 33, 34 and 35 mm. Ten males were 19, 19, 20, 21, 22, 23, 23, 25, 28 and 29 mm. There is not a corresponding disparity in body sizes within each sex. Wings of short-winged females do not reach the end of the abdomen, but are sub-equal in males. The insects, though flightless, are active runners. This species is the largest in the genus."

" Head almost black ; eyes black ; ocelli light, hair on vertex confined to occipital ridge and two small warts ; a tuft above the median ocellus and dense hair of frons black, with a few brown hairs intermixed ; sides of genae wide and bare ; antennae fine, longer than wings of short-winged forms, black, very finely pilose, annulated brown."

" Prothorax wider than usual in this family ; long hair over the tergum and plurae, black above and lighter at sides, ending just above bases of coxae in a tuft of forwardly directed golden-brown hair ; mesothorax dark, glossy brown ; a few brown hairs ; metathorax light, bare ; legs long and robust ; coxae brown ; anterior surfaces of fore and middle coxae clothed with long brown hair ; hind legs and femurs of others, yellowish-brown ; tibiae and tarsi of fore and middle legs brown."

" Wings vary in form from the somewhat symmetrical type figured to a form like that of the genotype ; the holotype shows patches of golden hair, and similar hair in the fringe opposite the termini of veins ; the folded costal area in the ♂ is narrow ; the forewings of all specimens agree in being semi-transparent, in having venation strongly marked, in being sparsely covered with hair ; the fringes are short, dark, and absent from the basal part of the posterior margin ; the hindwings are transparent and fairly evenly and sparsely covered with fine black hair, and the fringes short, black."

"Abdomen dark brown above, lighter below ; ♀ very robust ; shields on fifth sternite weakly defined ; sixth sternite with a short peg-like tooth, seventh or last visible sternite with posterior margin well defined, brown, and produced mid-ventrally in an obtuse angle ; from beneath the margin of the seventh sternite, on each side of the process is a rounded chitinous flap, possibly parts of a much reduced eighth

sternite ; immediately posterior to the process is a triangular plate, cleft at the apex ; laterally, from beneath the sides of the seventh segment, come two hard concave sclerites, chestnut in colour ; the terminal part of the abdomen is compressed between these sclerites."

"In the ♂ the abdomen is sub-cylindrical and ends abruptly, with very little taper. A short tooth on the antepenultimate sternite ; ninth segment apparently incomplete dorsally ; proctiger short, broad, with a lobe on each side ; inferior appendages large, brown, with darker, club-like styles encircling the genital cavity to meet above the proctiger ; intermed. [superior.—D. E. K.] app. small, and directed upward inside the inf. app ; genital cavity deep and large, with dark brown terminal

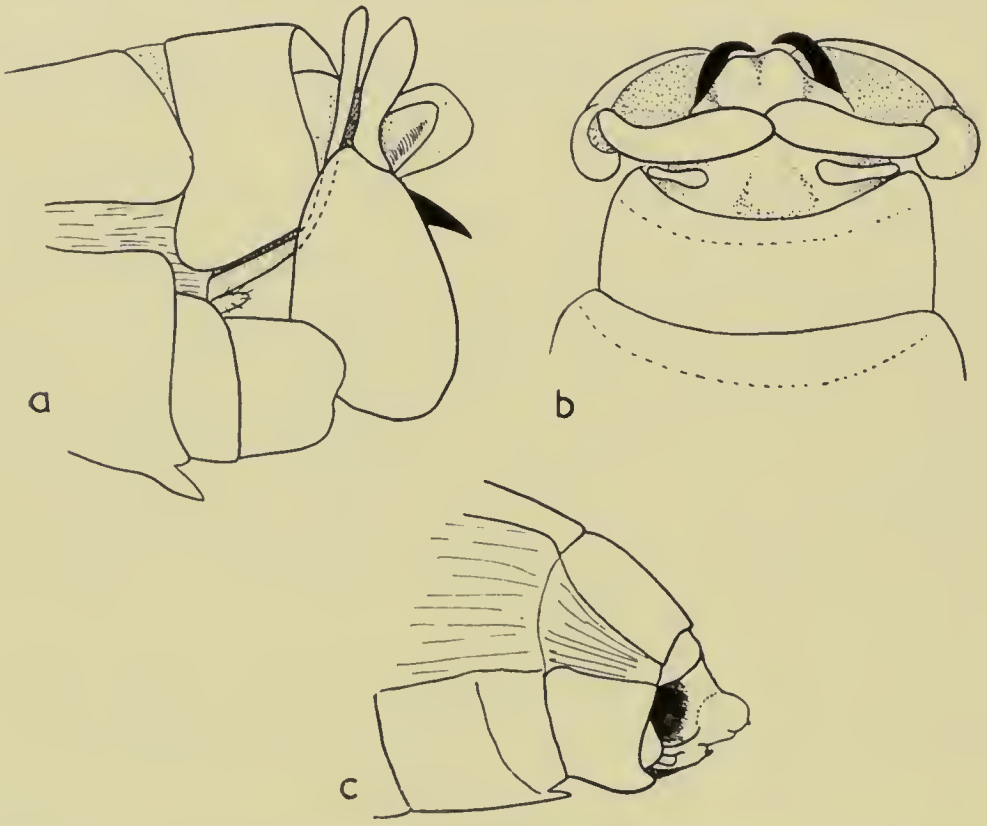

FIG. 321.—*Costachorema brachyptera* McFarlane. ♂♀ genitalia. *a*, ♂ lateral ; *b*, ♂ dorsal ; ♀ lateral (after McFarlane).

hooks of aedeagus projecting like sister-hooks. In the genital cavity are three pairs of appendages dorsal to the intermed. [superior.—D. E. K.] app. The lowest—blade-like, dark brown, widest at base—is probably a paramere of the aedeagus : the middle one—short, slender and clubbed—is probably the sup. app. [upper penis-cover.—D. E. K.] : the upper, which is broad and short, is apparently homologous with the chitinous plates below the proctiger in the genotype."

"Holotype ♂, allotype ♀ and series of paratypes in Canterbury Museum. Wings and genitalia mounted."

"Habitat : Edwards River, in Arthur's Pass National Park, at 3500 feet. above sea level [NEW ZEALAND]. The stream is very cold and fast, but the substratum not greatly subject to disruption."

"Adult insects February to May."

Costachorema xanthoptera McFarlane (fig. 322).

Costachorema xanthoptera McFarlane, 1939, *Trans. Proc. R. Soc. N.Z.*, 69 : 336–337, figs. 21, 22.

Insect yellowish, darker in the female. In both the *maxillary* and the *labial palpi* the stipes are long and might well be mistaken for an extra joint.

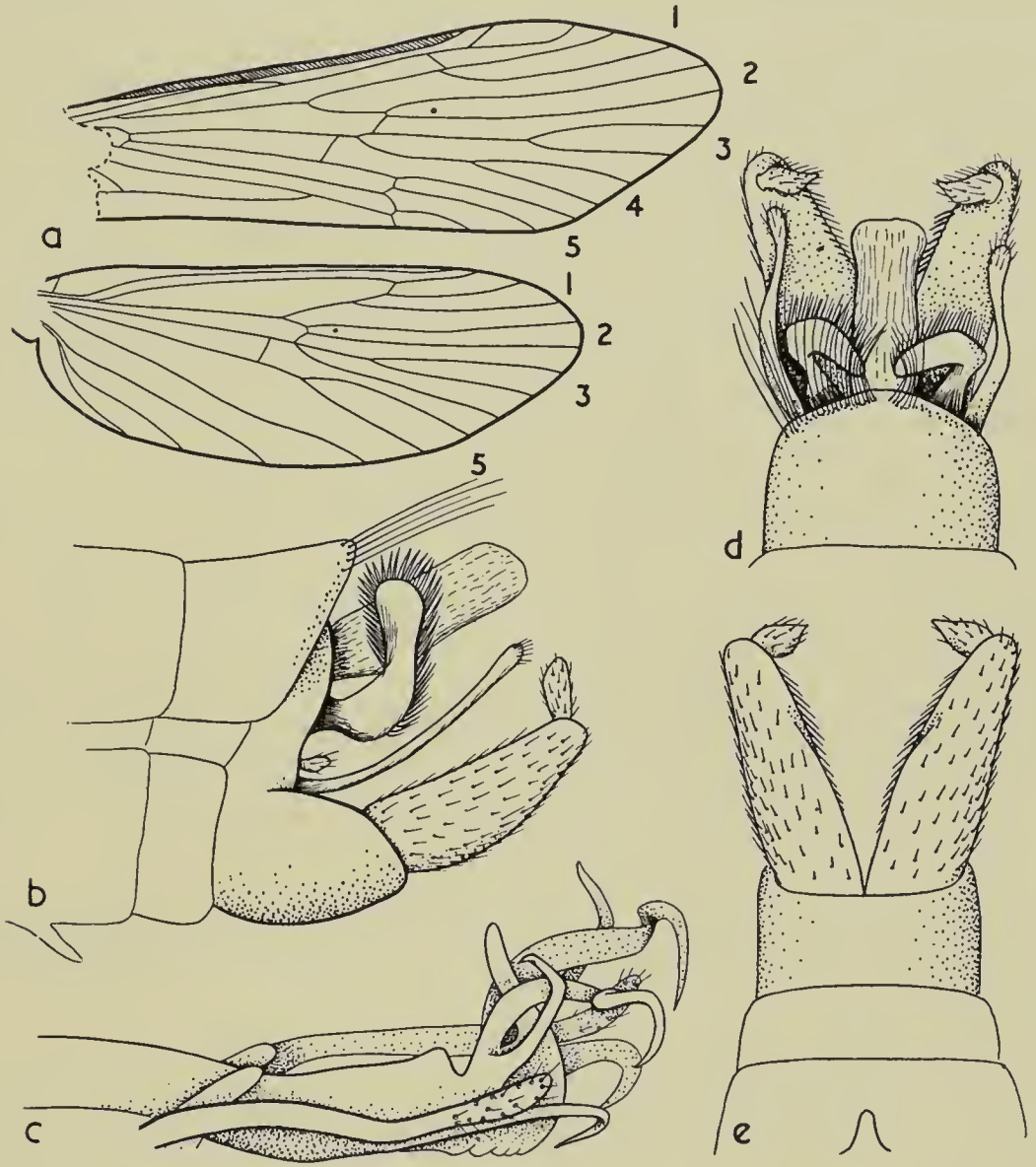

Fig. 322.—*Costachorema xanthoptera* McFarlane. ♂. *a*, wings ; *b*, genitalia, lateral (penis, etc., omitted) ; *c*, penis, etc., dorso-lateral ; *d*, genitalia, dorsal ; *e*, inferior appendages, ventral.

Maxillary palpi long and slender. First joint very short, second about twice as long, third about the length of the first two together, fourth a little shorter than the third, fifth a little longer than the third.

Genitalia, ♂.—Apical margin of the eighth tergite produced, rounded and evenly fringed with stiff hairs, which are all slightly bent outward at the middle, so that they enclose a lozenge-shaped space midway. Ninth segment much reduced dorsally, with the dorsal margin membranous and with a long, membranous, oblong dorsal plate directed slightly upward. From the side the segment projects only slightly above the eighth sternite so that it is almost entirely situated in the under half of the abdomen. From the side the distal margin is deeply excised, and in the excision may be seen the superior appendages, which are very long and slender with slightly dilated apices : above them at their bases is a small hairy wart. Upper penis-cover in the form of two stout processes, fringed with long teeth and bent upward from the side at about midway ; apices dilated, apical margins rounded. From beneath the upper penis-cover proceeds a pair of slender, rod-like processes directed distally. Penis furnished with a complicated system of twisted hooks and spines, some of which no doubt pertain to a lower penis-cover. Inferior appendages two-jointed. Basal joint stout and long, fringed with short teeth on the lower inner margins. Terminal joint very short ; lower margin sinuous ; apex sharply pointed. Attached to the second tergite, internally, is a pair of small chitinous sacs.

Length of the anterior wing, ♂, 13 mm.

Type in the Canterbury Museum, N.Z. Other examples in the British Museum (N.H.).

New Zealand : North Island, Ohakune, 20.ix.19, T. R. Harris : L. Te-Ka-Po, Canterbury (McLachlan Coll.) ; Milford Sound, 4.iv.1923, C. L. Edwards ; New Zealand (no further data), A. H. Batten-Pooll.

The specimen from Milford Sound is a female and its association with the male must be considered a little doubtful. The specimen collected by Batten-Pooll was taken from the stomach of a trout. It is much mutilated, but one pair of wings and the abdomen are complete, head missing. This specimen is a male.

A specimen in the Tillyard Collection, of which only the head, one anterior leg and one anterior wing remains, belongs here. It is labelled Gouland Downs, 7th Feb., 1922, and was wrongly determined as *Hydrobiosis umbripennis* McLachlan.

Costachorema psaroptera McFarlane (figs. 323, 324).

Costachorema psaroptera McFarlane., 1939, *Trans. Proc. R. Soc. N.Z.*, **69** : 335–336, figs. 4, 8, 18, 19, 20.

I am unacquainted with this insect which McFarlane describes as follows :

" Expanse : male, 30 mm. ; female, 30 to 35 mm."

" Head : antennae shorter than forewings, basal joint large, inner surface with fine white hair, outer side bare ; remainder light yellowish-brown, annulations being indistinct basally, and increasingly fuscous distally ; sparse black hairs on occipital ridge ; two lines of white hair from the median ocellus backwards ;

a dense covering on frons of mixed coarse black and white hair ; eyes large, dark ; ocelli light ; maxillary palpi dark, finely pubescent."

" Thorax : prothorax narrow, a few long white and black hairs upstanding ; mesothorax long, deep chestnut, two lines of long, fine, white hairs anteriorly ; metathorax bare, brown ; legs, long; hind-legs pale yellowish-brown ; middle and forelegs darker on tibiae and tarsi, but yellowish-brown proximally."

" Forewings in male folded at anterior margin as far as R_1, fold extending from the base to the pterostigma, which is small, and covering the greater part of Sc and the humeral veinlet. This fold is opaque and is double ; in the male Sc meets R_1

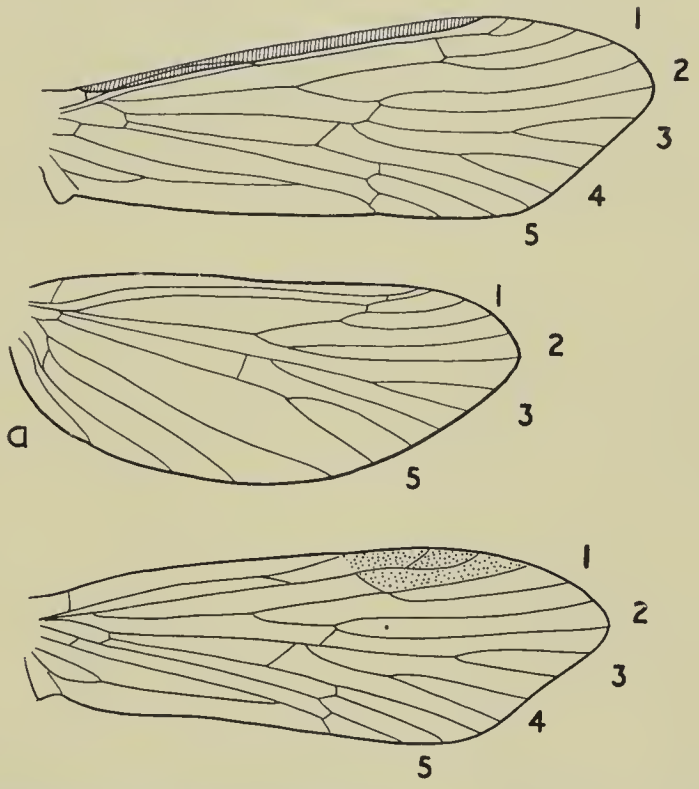

Fig. 323.—*Costachorema psaroptera* McFarlane. *a*, ♂ wings ; *b*, ♀ anterior wing (after McFarlane).

a little basad from the fork of Rs, and in the female opposite the point of bifurcation of R_4 and $_5$; termen slightly concave ; fringe short with light spots at termini of veins ; wing semi-transparent, finely mottled greyish effects in the distal half, faintly brownish in the proximal half ; a thin white band from the distal end of the pterostigma to Cu_2, roughly parallels the apical margin ; a band of black hair from the base of the wing parallel to the posterior margin as far as the junction of A_2 and A_3 ; from the end of this in the male, to a little beyond the end of A_3, is a white patch with a tuft of white hair, on Cu_2, while in the female this area is light brown with a narrow hyaline line from the terminus of A_3 to the point of bifurcation of Cu_1 ; veins strongly marked, concolorous with the mottling of the wing, and with sparse, weak, light to white, upstanding hairs ; the wing membrane is clothed sparsely with fine hairs, white and darker, and, in the region of the tornus, with occasional reddish hairs ; hind wings hyaline with light fringes."

"Abdomen dark above and light yellowish-brown below ; in the female no tooth on the fifth sternite, a small one on the sixth, and a larger broad tooth on the seventh ; part posterior to the seventh segment laterally compressed and no sternites visible ;

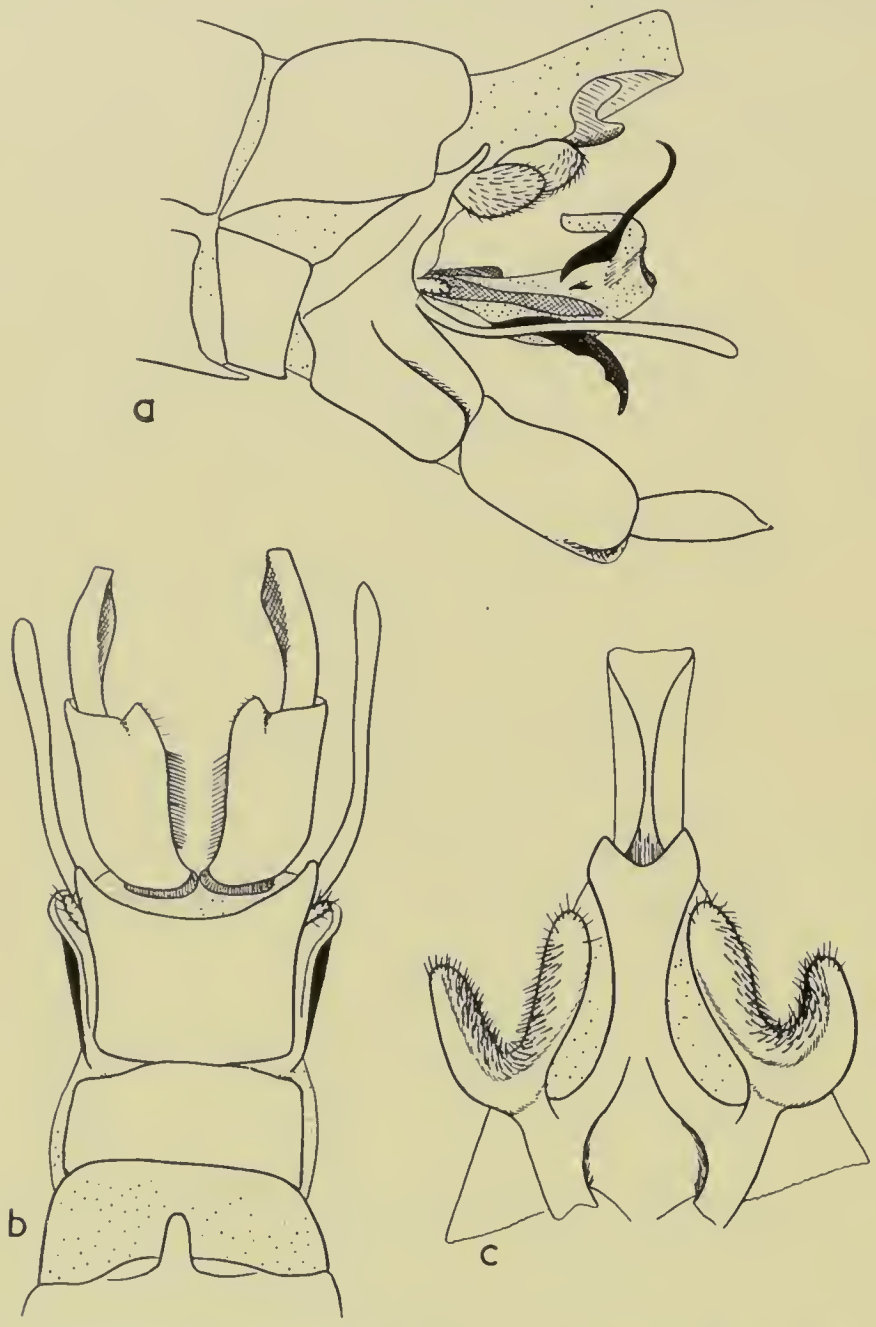

FIG. 324.—*Costachorema psaroptera* McFarlane. ♂ genitalia (after McFarlane). *a*, lateral ; *b*, ventral ; *c*, proctiger from below, showing upper penis-cover and sclerotized plate.

in the male the antepenultimate sternite is toothed ; in the penultimate segment the tergite is twice as long as the sternite and wider ; posterior margin of terminal tergite is broadly incised, and, from the angle of the incision, is a deep mid-dorsal

cleft ; the superior appendages [upper penis-cover.—D. E. K.] are semi-transparent, brown ; seen from the side each appears as two very prickly leaves ; from below each is like a letter U on a short stalk, the inner side of the U being densely covered with stout brown spines (fig. 322) ; the chitinous base of the appendages extends on the under side of the proctiger to form a fish-tail ; two thin chitinous plates sheathe the distal part of the proctiger ventrally ; intermediate [superior.—D. E. K.] appendages fine and clubbed ; short hairy appendages at their bases, dorsally ; inferior appendages strong, concave on inner surfaces of both joints, with strong spines on the inner edges of the basal joints. The aedeagus is a soft, bulbous organ, the terminal portion of which can be rotated through 180° in the dorso-ventral plane ; when fully extended the small pair of terminal appendages take up the middle position ; the parameres are bifid from the base, the longer outer portion having a tuft of brown bristles towards the end."

"Holotype ♂ ; allotype ♀ and series of paratypes ; and preparations of wings and genitalia in the Canterbury Museum."

"Habitat : [New Zealand : upper Waimakariri River watershed] fast, stony, cold streams in open tussock country from 1000 to 2600 ft. above sea level. Plentiful in suitable streams."

Austrochorema gen. n.

Spurs 2, 4, 4. In the *anterior wing*, forks nos. 1, 2, 3, 4 and 5 present ; nos. 1 and 2 sessile, the others with foot-stalks. Pterostigma heavily shaded ; radius forked ; discoidal cell open. In the *posterior wing*, forks nos. 1, 2, 3 and 5 present, all with foot-stalks. In the ♂ *genitalia* the inferior appendages are two-jointed. There is a long and possibly two-jointed filament to the fifth segment and a single process to the seventh.

Type species.—*Austrochorema wenta* sp. n.

The genus closely resembles *Costachorema*, differing in the presence of foot-stalks to many of the forks and carrying a lateral filament to the fifth segment.

Austrochorema wenta sp. n. (figs. 325, 326).

Insect small with uniformly brownish *wings*. Pterostigma only slightly darker than the rest of the wing. *Head* dull ochraceous. *Ocelli* white. Oculi muddy brown. Basal joint of the *antenna* of the same colour as the head ; remaining joints, *palpi* and *legs* lighter.

Genitalia, ♂.—Dorsal plate triangular, short, broad at the base, extremely acute at the apex. Superior appendages very slender, slightly dilated towards the apices, with a rounded dilatation of the under surface at the base ; they are shorter than the dorsal plate, with a rounded wart above them at the base. Upper penis-cover forming a pair of short, parallel, downturned processes. Penis obscure. Sheaths very long and slender at their apices, curling towards and crossing each other beyond the apex of the penis. Inferior appendages two-jointed. Basal joint very large ; inner margin turned in and serrate, with a short, slender process arising from the lower, inner angle. Terminal joint large and stout, strongly dilated on the lower margin to make an angular projection. Apical margin of the ninth sternite produced in a large triangle. A large, spatulate process to the seventh sternite. Filaments

of the fifth segment long ; apex apparently constricted to make a small, second joint.

Genitalia, ♀.—Apex of the abdomen bluntly triangular. Dorsally there is a triangular hood bearing two rounded disks near the apex, the sides of the

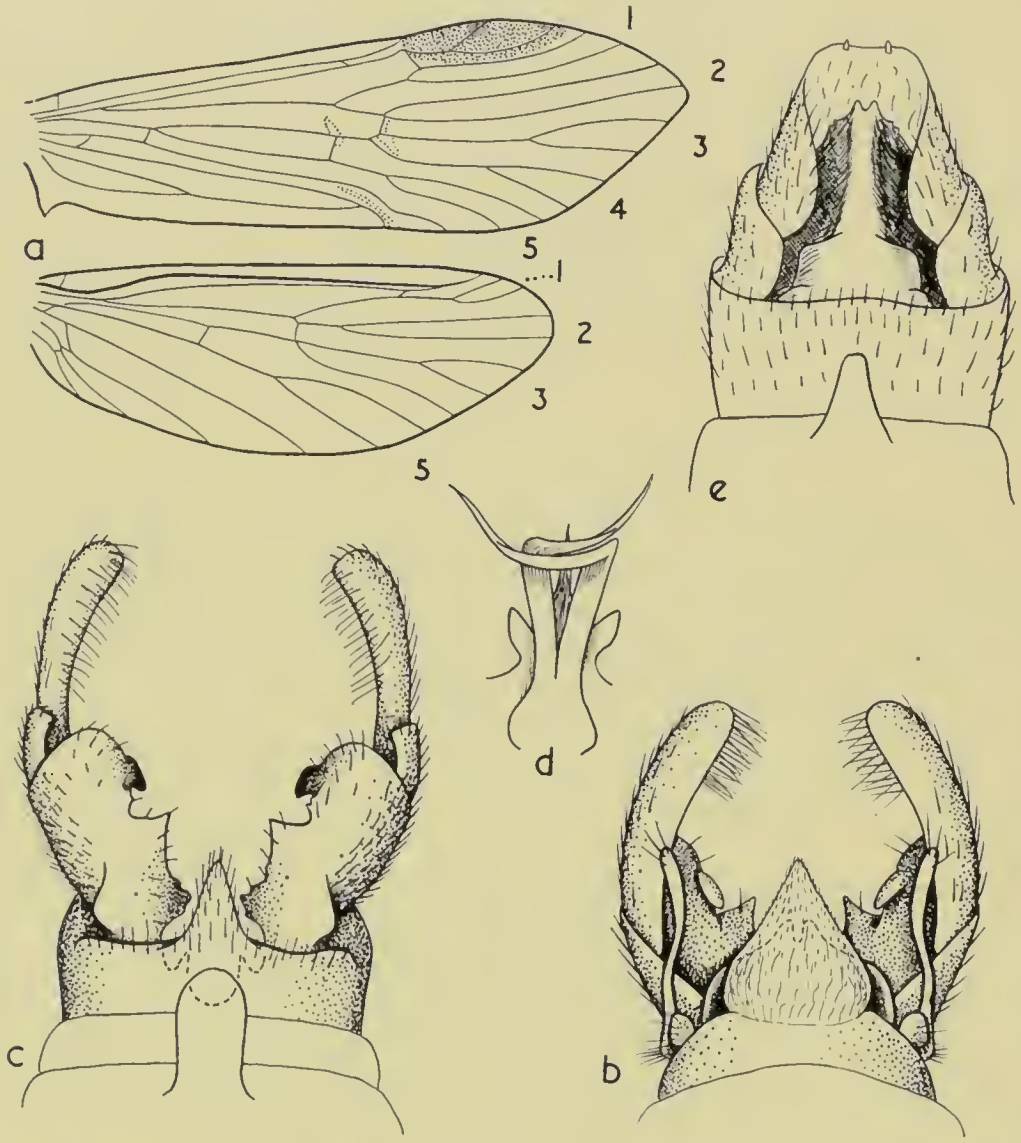

Fig. 325.—*Austrochorema wenta* gen. sp. n. *a*, ♂ wings ; *b*, ♂ genitalia, dorsal ; *c*, ♂ inferior appendages, ventral ; *d*, penis, etc., ventral ; *e*, ♀ genitalia, ventral.

hood turned partly to cover the ventral segment. A strong process to the sixth sternite.

Length of anterior wing, ♂ and ♀, 6 mm.

Australia : New South Wales, Wentworth Falls, 18.xi.1921, 1 ♂, 1 ♀. Mt. Kosciusko, 24.xi.1921, 1 ♂, R. J. Tillyard.

Tasmania : Mt. Wellington, ii.1938, 1 ♂, J. W. Evans.
Type, ♂, Wentworth Falls. The paratype, ♂, from Mt. Kosciusko presents

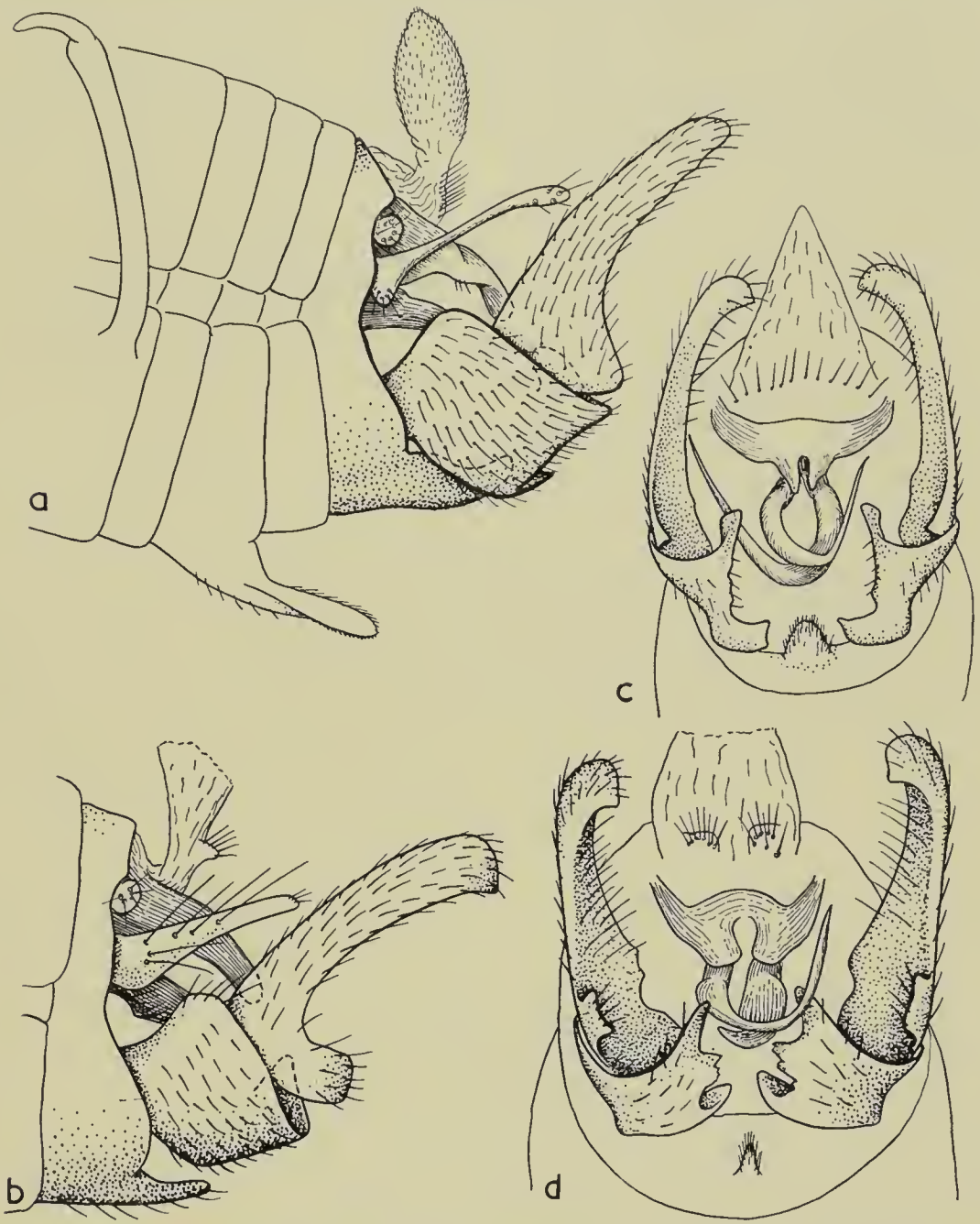

Fig. 326.—*Austrochorema wenta* gen. sp. n. ♂ genitalia. *a*, lateral ; *b*, *variety*, lateral ; *c*, from beneath and behind ; *d*, *variety*, from beneath and behind.

certain variations in structure, which are shown in fig. 326. I do not consider that these differences are of sufficient importance to warrant the erection of a distinct species.

Allobiosis gen. n.

Spurs 2, 4, 4. Radius forked in the *anterior wing* with forks nos. 1, 2, 3, 4 and 5 present, all with foot-stalks. Foot-stalks of nos. 4 and 5 bowed outward to enclose a circular space comparatively denuded. Discoidal cell wanting. *Posterior wing* with forks nos. 3 and 5, possibly also no. 1. In the type species, a female, the abdomen terminates in a long, slender and slightly upcurved ovipositor.

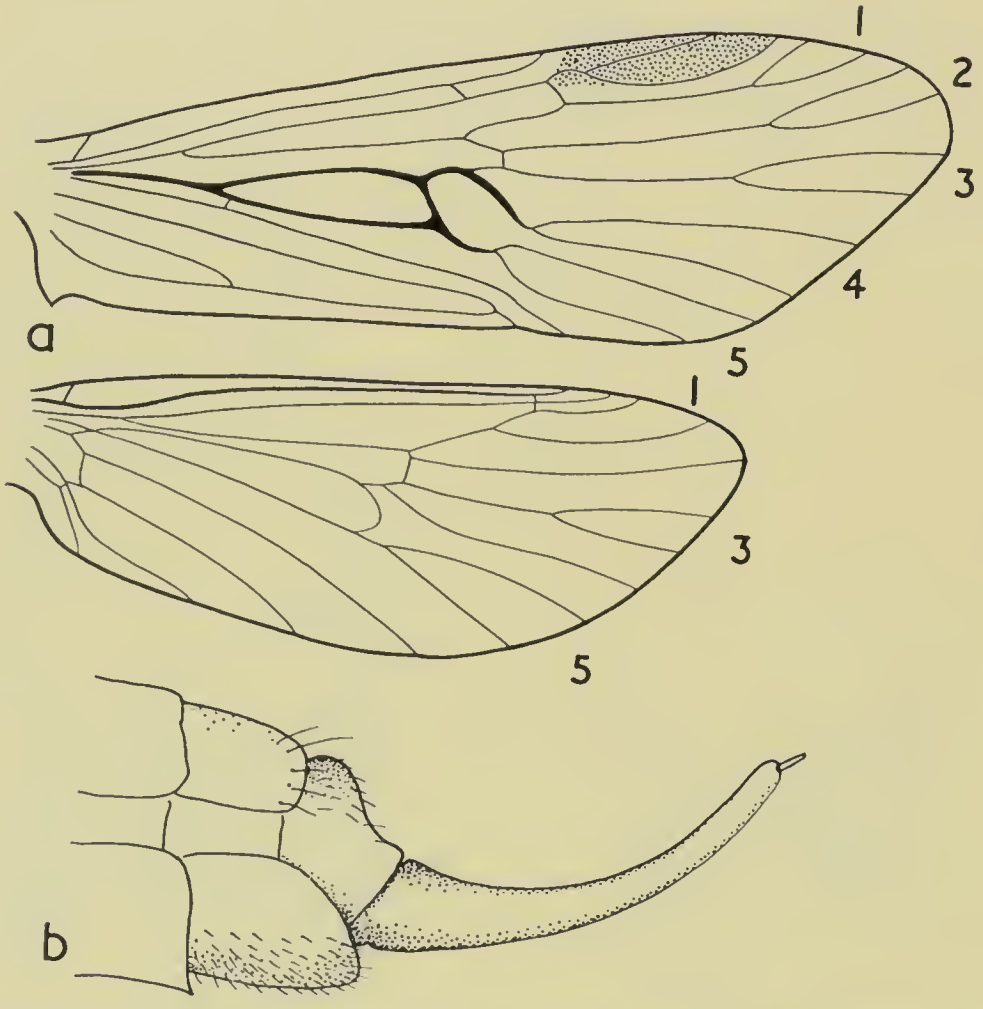

Fig. 327.—*Allobiosis erratica* gen. sp. n. ♀. *a*, wings; *b*, genitalia, lateral.

Type species.—*Allobiosis erratica* sp. n.

The genus is founded on a single specimen, a female, and is distinguished from all other described genera in the family by the extraordinary formation at the bases of forks nos. 4 and 5 of the anterior wing. It would appear to be allied to Banks' *Psyllobetina* but differs in neuration, particularly in the shape of fork no. 2 and the foot-stalks of forks nos. 4 and 5 in the anterior wing.

Allobiosis erratica sp. n. (fig. 327).

Insect of moderate size; ochraceous. *Head*, dark ochraceous with ochraceous hairs. *Antennae*, *legs* and *palpi* the same colour as the head; *anterior wing* fulvous, with many pale, semi-erect hairs. Pterostigma well-defined. Radius forked. Forks nos. 1, 2, 3, 4 and 5 present, nos. 1, 2 and 3 with very long foot-stalks, the foot-stalks of 4 and 5 curve outwards to enclose a circular space somewhat denuded. In the *posterior wing* forks nos. 1 (?), 3 and 5 present.

♂. Unknown.

Genitalia, ♀.—Abdomen terminates in a long, slender and slightly upcurved ovipositor, at the apex of which is a pair of minute, divergent processes. A short process to the sixth sternite.

Length of the anterior wing, ♀, 6 mm.

AUSTRALIA: New South Wales, Wentworth Falls, 23.ii.16, 1 ♀, R. J. Tillyard.

Psyllobetina Banks.

Psyllobetina Banks, 1939, *Bull. Mus. Comp. Zool. Harv.*, **85**: 501.

Banks describes the genus as follows:

"A division of Hydrobiosis, with the anastomosis before the stigmal area, discal cell of fore wings open, fork one pedicellate, fork two back to the cross vein from radial sector to medius, forks three, four and five subequal, in hind wings no fork one, fork two broad at base: female with a long, slender, upcurved ovipositor."

"The genus Typhiobiosis [*Tiphobiosis*] of New Zealand has the discal cell open, but is otherwise very different."

Type species.—*Psyllobetina plutonis* Banks, 1939.

Psyllobetina plutonis Bank (fig. 328).

Psyllobetina plutonis Banks, 1939, *Bull. Mus. Comp. Zool. Harv.*, **85**: 501–502, figs. 22, 52, 57.

Banks describes the species as follows:

"Head black, with a few pale hairs; palpi brown, antennae brown on basal joints, yellowish beyond; thorax black, with yellowish brown hair; abdomen dull black; legs yellowish brown. Fore wings brown, with scattered black hair, stigma very distinct, black; hyaline white marks as follows: one from medius before forking obliquely up to forking of radial sector, one over cross-vein from radial sector to medius and extended to base of fork four, one up from end of anals to base of fork five, a small one from radial sector to radius at base of stigma, and a fine line along upper side of medius; veins brown. Hind wings gray, with black hair and fringe, veins brownish"

"In fore wings fork one is long pedicellate, fork two more than twice as long as fork one, fork three shorter and with a pedicel two-thirds its length, fork four very long, almost as far back as fork five, cross-vein from medius to cubitus is strongly bowed outward, and in hind wing still more so. In hind wing no fork one, fork two broad at base, fork three with a short pedicel, fork five almost back to the bowed cross-vein."

"Fore wing 7 mm. long."

"From Blackheath, Blue Mts., New South Wales, Australia. 18 Jan. (Darlington)."

Type in the Museum of Comparative Zoology, Harvard College, U.S.A.

There is an example of this species, also a ♀, in the British Museum (N.H.) labelled Australia, Queensland, Killarney, 9.ii.14, from which the accompanying figures have been drawn.

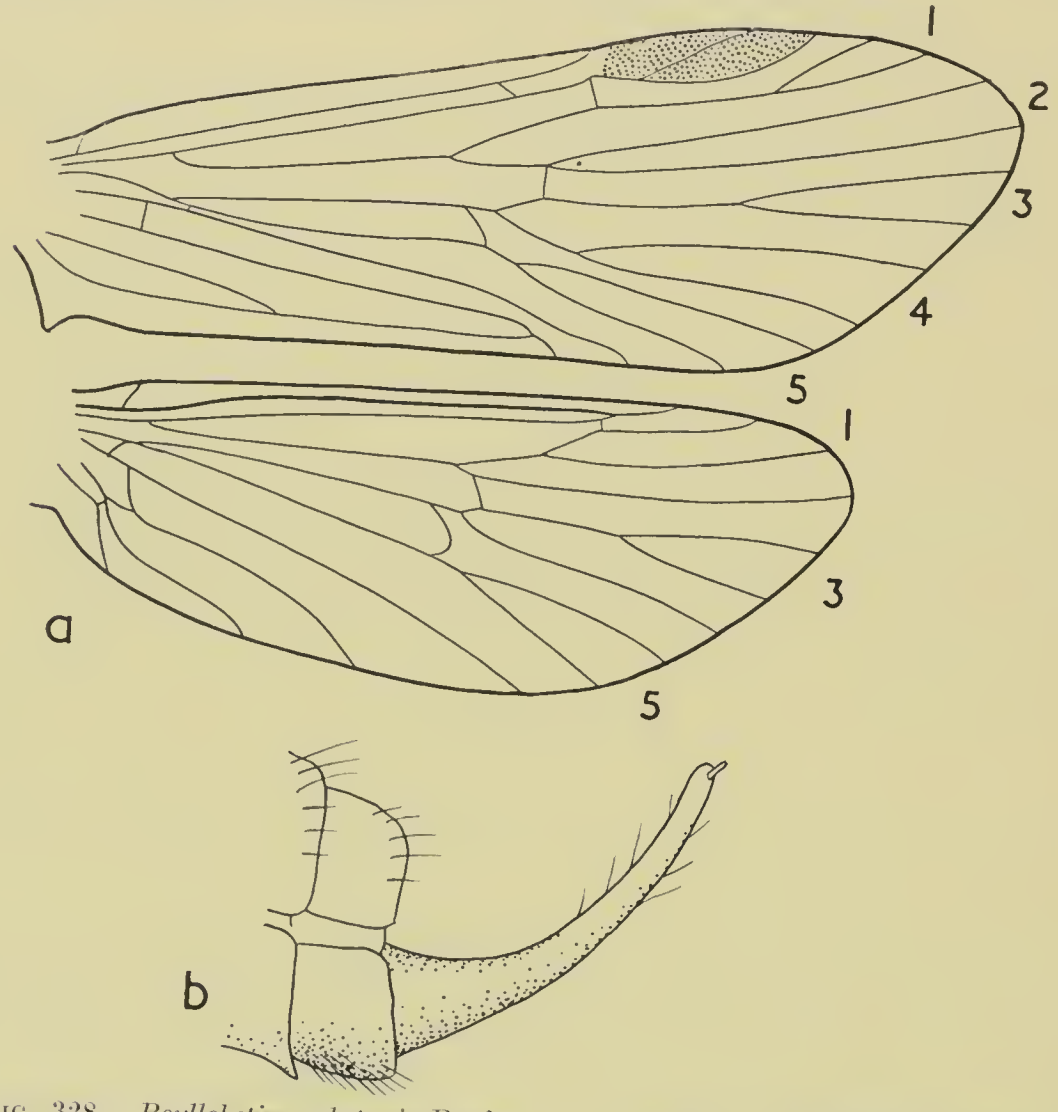

FIG. 328.—*Psyllobetina plutonis* Banks. ♀. *a*, wings; *b*, genitalia, lateral.

Tiphobiosis Tillyard.

Tiphobiosis Tillyard, 1924, *Trans. N. Zeal. Inst.*, **55** : 298, text-fig. 13.

Tillyard describes the genus as follows :

"Wings narrow, forewing with posterior margin parallel to costa, apex symmetrically pointed and lying between R_5 and M_1; hindwing also pointed, apex just below R_5. Forewing with all five apical forks present; hindwing with only

1, 2 and 5. Pterostigma strongly developed in forewing. No closed cells present in either wing, except only thyridial cell of forewing. Se well developed in both wings, R_1 and basal part of M obsolescent in hindwing. Fore wing with fork of Cu_1 of specialized form, very narrow ; 2A meets 1A close to its end, and 3A meets 2A about half-way along its length. Tibial spurs 2, 4, 4, those of fore tibiae greatly reduced. Male with short gonapophyses but long pre-anal appendages and outgrowth of tenth tergite. Female with end segments of abdomen very long and narrow, forming an elongated ovipositor with the two minute ear-like gonapophyses at the extremity."

Type species.—*Tiphobiosis montana* Tillyard, 1924.

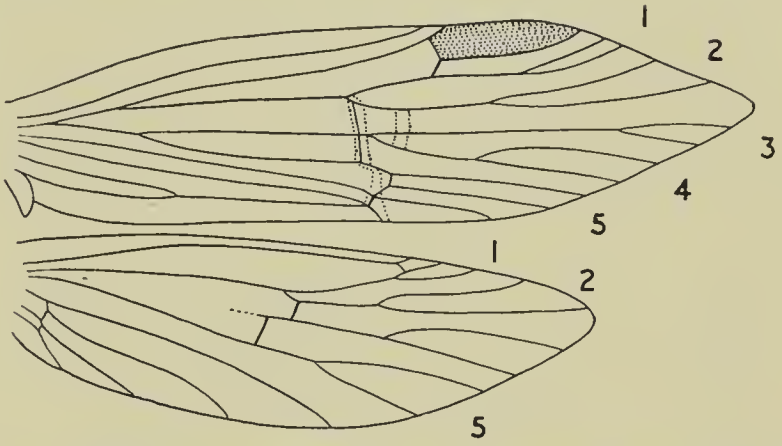

Fig. 329.—*Tiphobiosis montana* Tillyard. ♂ wings (after Tillyard).

Key to Species of *Tiphobiosis*.

1. Apical fork no. 1 in anterior wing reaching back to the cross-vein below the pterostigma ; anterior wing about 8 mm. long . *T. fulva* Tillyard (p. 489).
–. Apical fork no. 1 in anterior wing not reaching the cross-vein below the pterostigma ; anterior wing about 5 mm. long . . . . . 2.
2. Apical fork no. 2 in anterior wing at its base level with base of fork no. 4 *T. montana* Tillyard (p. 487).
–. Apical fork no. 2 in anterior wing reaching further basally than the base of fork no. 4 . . . . . *T. intermedia* sp. n. (p. 491).

Tiphobiosis montana Tillyard (figs. 329, 330).

Tiphobiosis montana Tillyard, 1924, *Trans. N. Zeal. Inst.*, 55 : 299–300, pl. 19, fig. 13, text-figs. 13, 14.

Tillyard describes the species as follows :

" ♂. Total length, 3·5 mm. ; fore wing, 5·2 mm. ; expanse, 11 mm.

Head, thorax and *abdomen* dull-blackish ; eyes black ; vertex covered with pale-greyish hairs ; antennae nearly as long as forewing, dark brown, basal segment swollen, two and a half times as long as second segment, the third longer and narrower than second ; last segment of maxillary palpi a little longer than fourth. Legs—coxae and femora dark-brownish, tibiae and tarsi medium testaceous."

" *Wings.*—Forewing pale testaceous, with numerous upstanding hairs of a pale-golden colour, giving the wing a slight tinge of yellowish ; costal and posterior

margins a little darker than rest; pterostigma 1 mm. long, darkened. From fork of Rs a cross-vein descends on to M exactly above thyridial cross-vein; a pale subhyaline space encloses these cross-veins, and another similar space occurs a little

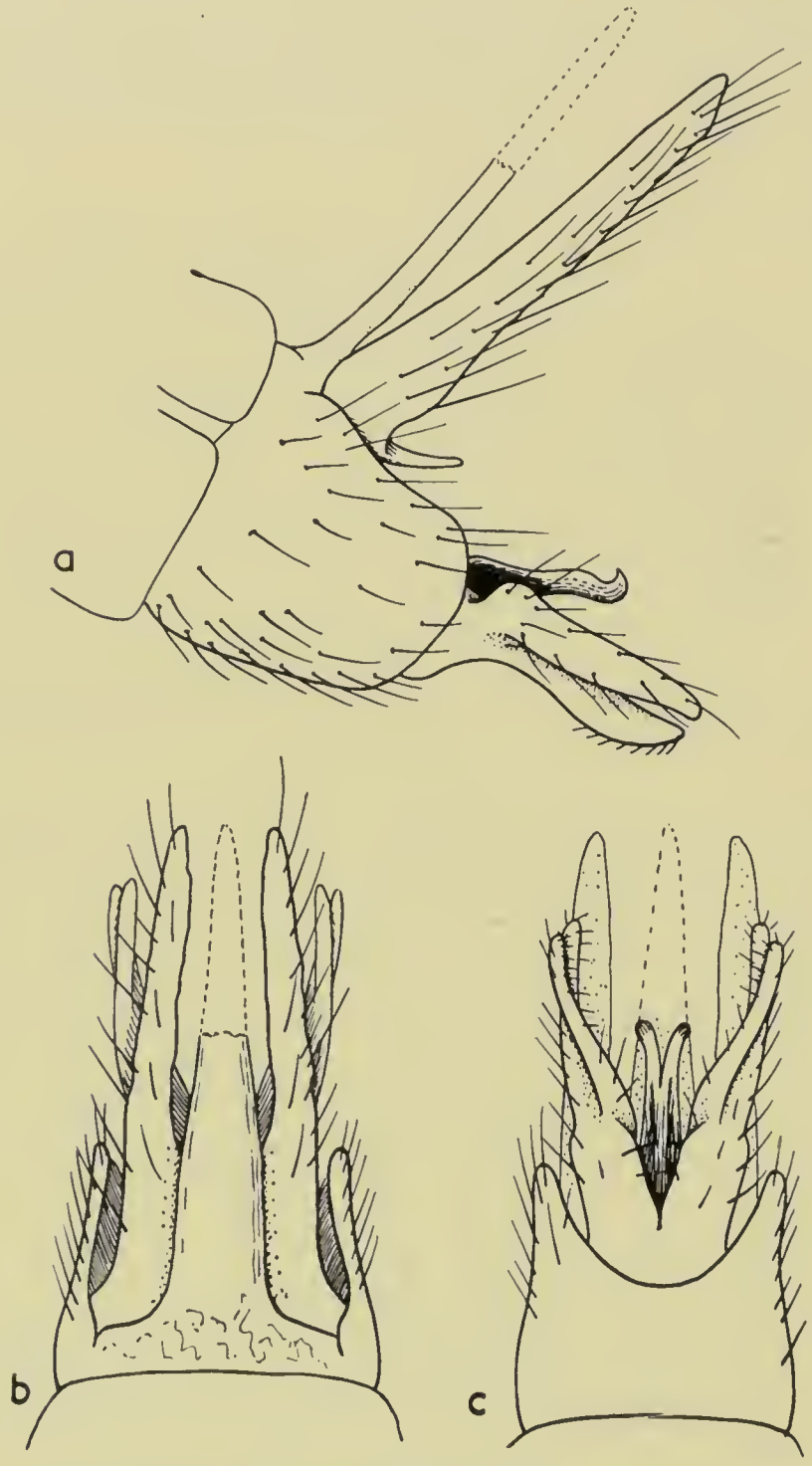

FIG. 330.—*Tiphobiosis montana* Tillyard. ♂ genitalia. *a*, lateral. *b*, dorsal; *c*, ventral.

distad from it. Hindwing subhyaline, slightly infuscated, with two cross-veins corresponding with the two mentioned above for forewing, but not quite in line with one another. Ninth sternite greatly elongated. Appendages of very remarkable form as shown in fig. 330 ; the process of the tenth tergite and pre-anal appendages long and slender, penis shorter, with bifid apex, gonapophyses short."

"♀. Very similar to male, but differing from it in the slightly darker, more fuscous forewings, and in having the abdomen produced into a semitransparent brownish ovipositor, 1·5 mm. long, carrying a number of stiff bristles directed both forwards and backwards ; gonapophyses ear-like, minute, 0·07 mm. long.

"*Types.*—Holotype male, Ben Lomond, Queenstown, 4000 ft. (15th December, 1919, R. J. T.), also several paratype males taken at the same time ; allotype female, Gouland Downs, 2000 ft., Nelson Province (7th February, 1922, R. J. T.) : all in Cawthron Institute collection."

"*Habitat.*—Swampy areas in subalpine localities, South Island."

To Tillyard's description of the species, I add :

Genitalia, ♂.—Ninth segment strongly chitinized in the lower half corresponding to the sternite, redueed to a transparent membrane above. Arising

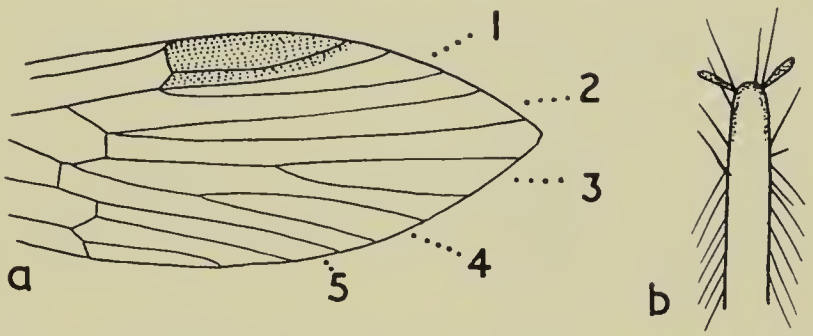

Fig. 331.—*Tiphobiosis fulva* Tillyard. ♀ (after Tillyard). *a*, apex of anterior wing ; *b*, tip of abdomen.

from this membrane, in the centre of the segment, is an elongate, narrow, membranous dorsal plate (broken in the example here described). Below this are the superior appendages, situated one on eaeh side of the dorsal plate and are equal to it in length. At the base of each appendage, on the underside, is a very short, distally directed braneh. Penis very obseure. Lower penis-eover bifurcate from halfway, apices forming upturned hooks. Inferior appendages bifureate, the two forks approximately equal in length and width. Distal margin of the ninth segment, from beneath, deeply and roundly excised.

Tiphobiosis fulva Tillyard (fig. 331).

Tiphobiosis fulva Tillyard, 1924, *Trans. N. Zeal. Inst.*, **55** : 300, text-fig. 13*b*.

Tillyard describes the species as follows :

"♀ Forewing 8 mm. ; expanse, 17 mm."

"This species differs from the previous one in its much greater size, and also in having head clothed with rich brown hairs, forewings a deep fulvous,

with few upstanding hairs of a dark colour, and venation very distinct by the much greater length of apical forks, and the non-alignment of cross-veins, as shown

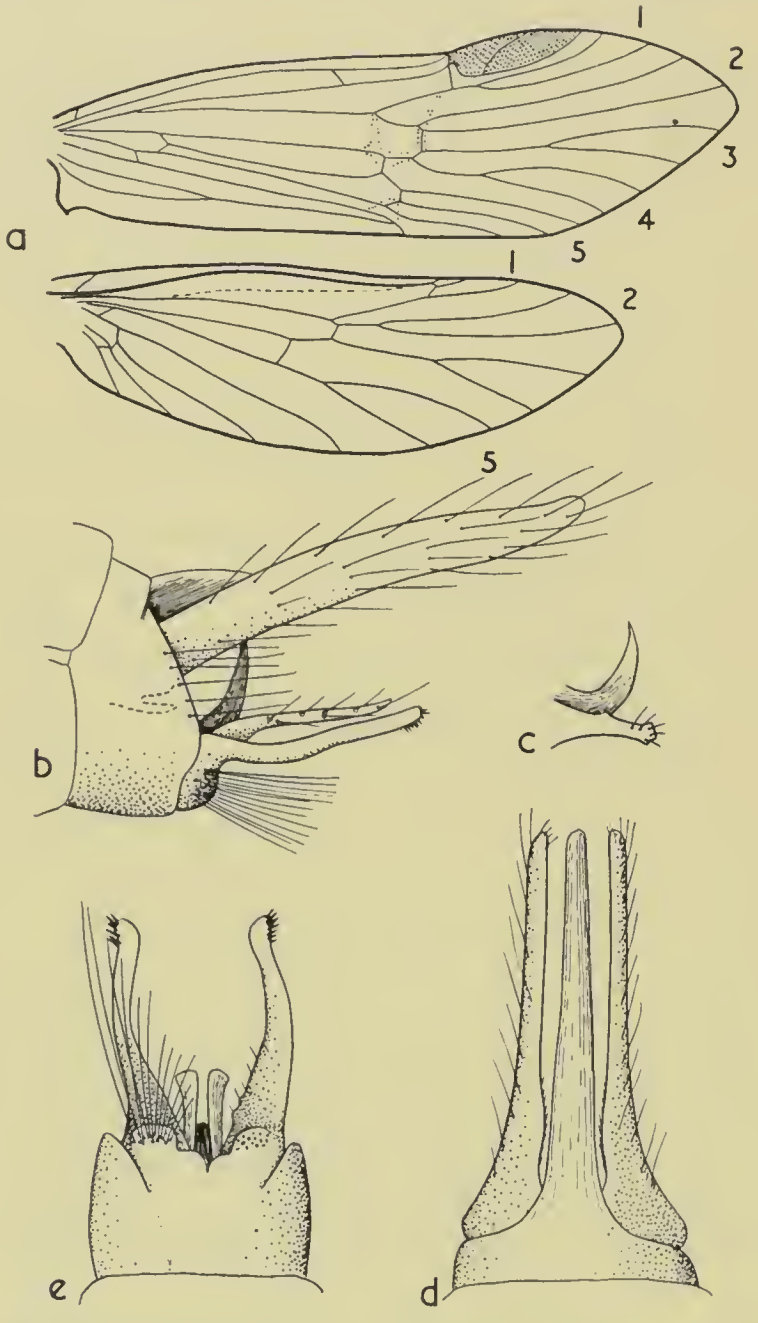

Fig. 332.—*Tiphobiosis intermedia* sp. n. ♂. *a*, wings; *b*, genitalia, lateral; *c*, penis and sheath, lateral; *d*, superior appendages and dorsal plate, dorsal; *e*, inferior appendages and penis and sheaths, ventral.

by fig. 331; also shape of apical portion of forewings is different, both margins being convex as they approach apex, whereas in *T. montana* they are both straight. The unique type is somewhat damaged and the abdomen is missing; when captured,

however, it was noted that the abdomen terminated in a very long, slender ovipositor, similar to that described for the previous species, but considerably longer."

"*Type*.—Holotype female, unique, captured by Mr. G. V. Hudson, near a waterfall on the Humboldt Range, Wakatipu, 3,600 ft. (2nd March, 1903); in Cawthron Institute collection, presented by Mr. Hudson."

Tiphobiosis intermedia sp. n. (fig. 332).

Insect small, yellowish. *Head* dark ochraceous, clothed with ochraceous hairs. Oculi black. *Antennae*, *palpi* and *legs* ochraceous. *Wings* ochraceous with darker, widely spaced hairs. Pterostigma darker, very distinct.

Genitalia, ♂.—Apical margin of the ninth tergite produced in a very long, transparent and tapering plate; on each side and slightly below it are two long, slender superior appendages of the same length as the dorsal plate but stronger in texture and fringed with hairs. From the side, they are comparatively stout. There is a short process arising at the base on the lower margin, directed distally. Penis in the form of an acute, upturned tooth with a lower penis-cover consisting of two short, parallel processes with clavate apices. Inferior appendages two-branched and slender. From the side, the lower branch the longer, with a dilated base. Apex from beneath, slightly clavate and set with short hairs.

Length of the anterior wing, ♂, 5 mm.

New Zealand: Arthur's Pass, January, 1903, 1 ♂, G. V. Hudson.

This species very closely resembles *T. montana*, but may be distinguished by the different relative lengths of forks nos. 2 and 4 in the anterior wing, and differences in the genitalia.

Allochorema gen. n.

Spurs 2, 4, 4. In the *anterior wing*, radius forked. Forks nos. 1, 2, 3, 4 and 5 present, all with foot-stalks; discoidal cell wanting. In the *posterior*, forks nos. 2, 3 and 5 present, all with foot-stalks. In the *genitalia* of the single known species there is apparently no dorsal plate in the male, and there are other structures in the genitalia of both sexes which differ considerably from the general pattern, as may be seen on reference to the figures.

Type species.—*Allochorema tasmanica* sp. n.

This genus differs from *Tiphobiosis* in the presence of apical fork no. 3 in the posterior wing, from *Allobiosis* and *Psyllobetina* in the absence of fork no. 1 in the posterior wing, and from *Bachorema* in the relative proportions of forks nos. 2 and 3 in the posterior wing and the absence of a median fold or pouch in the anterior wing.

Allochorema tasmanica sp. n. (fig. 333).

Insect of moderate size, brownish. *Head* ochraceous, covered with rather paler hairs. *Legs* and *palpi* of the same colour. *Antennae* paler. *Anterior wing* dark fuscous, covered with numerous erect, nearly black hairs, with two apparently paler bars towards the apex, but these may be due to denudation.

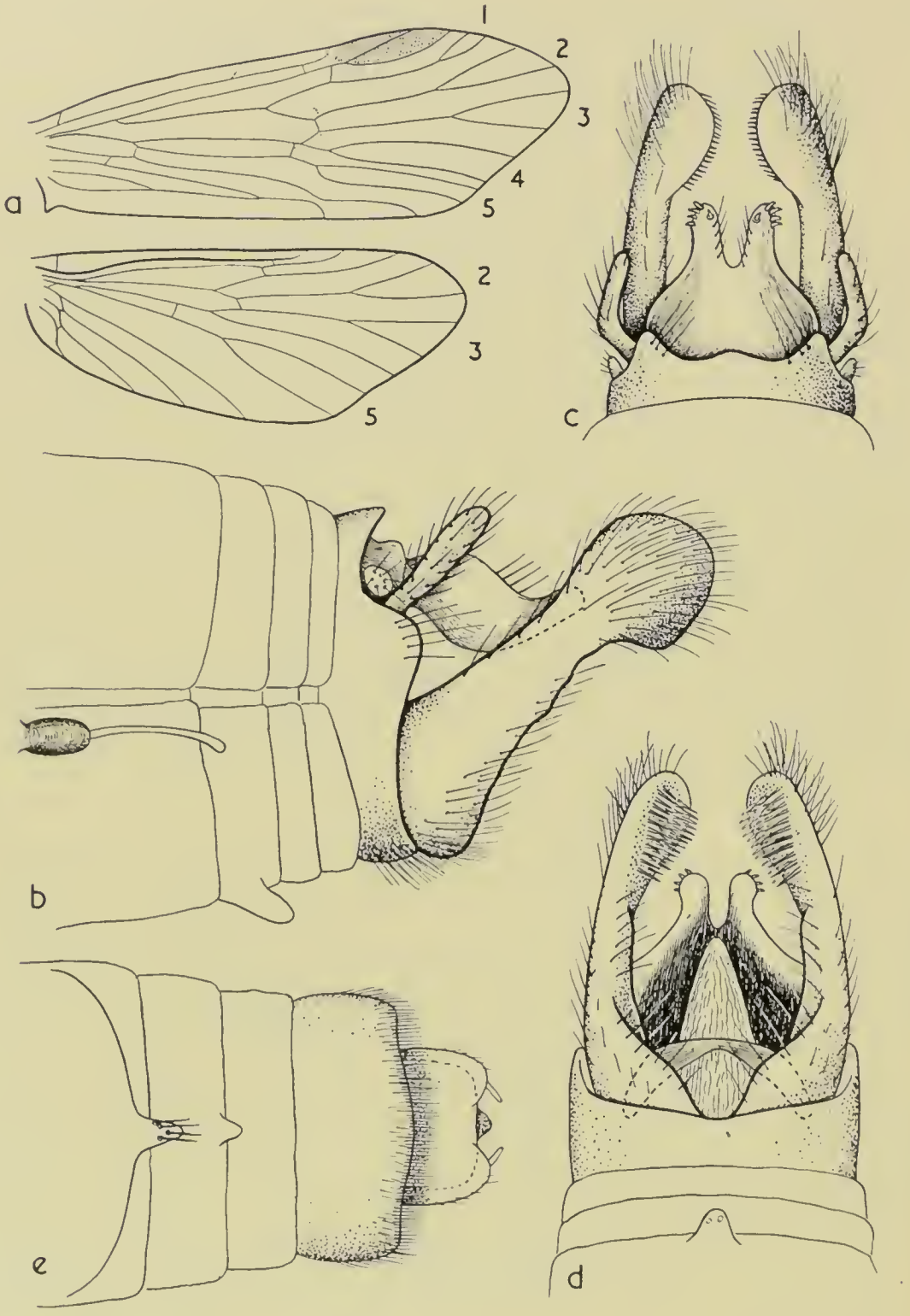

FIG. 333.—*Allochorema tasmanica* gen. sp. n. *a*, ♂ wings; *b*, ♂ genitalia lateral; *c*, ♂ dorsal; *d*, ♂ ventral; *e*, ♀ genitalia, ventral.

Genitalia, ♂.—No apparent dorsal plate. Apical margin of the ninth tergite slightly produced at its centre and more produced at its angles to make slightly produced triangles. The texture between these two triangles differs somewhat from the adjacent part, and perhaps this region may represent a rudimentary dorsal plate. Superior appendages short and rather stout, the warts at their bases very small. Upper penis-cover very large, wide at the base, deeply and roundly excised at the apex to leave a pair of outcurving processes ; apices set with short, stout teeth directed outward. These processes are fringed along their inner margins. Penis short and stout, triangular from beneath. Lower penis-cover (?) forming a pair of widely outstretched processes directed downward. Inferior appendages large, slightly constricted before the immensely dilated apices, whose inner surfaces are set with brushes of short spines. A short, blunt process to the sixth sternite. Filament of the fifth two-jointed, the basal joint short and wide with rounded sides. Second joint about twice as long as the basal and very slender.

Genitalia, ♀.—From above, the ninth tergite is produced in a triangle. Beyond it is a rectangular plate from the apical angles of which proceeds a pair of stout lobes, each bearing a short, slender appendage directed slightly inward. Seventh sternite with a short process. A longer one bearing a few stout hairs to the sixth is the continuation of a strong, raised ridge extending to the lateral margin of the sternite.

Length of the anterior wing, ♂, 7 mm. ; ♀, 6 mm.

Tasmania : Mt. Wellington, 3000 ft., xii.37, 1 ♂ (*type*), 1 ♀, J. W. Evans.

Bachorema gen. n.

The *genitalia* is at present known of only the type species, as in the second, *B. gisba*, the abdomen is wanting in the unique type. No doubt the arrangement of the genitalia more or less corresponds.

Spurs 2, 4, 4. *Neuration* irregular in the ♂, ♀ unknown. In the *anterior wing*, ♂, there is a small oblique pouch on or below the upper branch of the media more or less in the position of the median cell ; a downwardly directed fringe of long hairs on the media on its underside. Forks nos. 1, 2, 3, 4 and 5 present, no. 4 sessile, the others stalked. In the *posterior*, forks nos. 1, 2, 3 and 5 or 2, 3 and 5, all with foot-stalks.

In *obliqua*, inferior appendages two-jointed ; short processes to the sixth and seventh sternites ; lateral filaments to the fifth segment.

Type species.—*B. obliqua* sp. n.

This genus is closely related to the Fijian species of *Apsilochorema*, but differs (in the ♂) in the presence of apical fork no. 3 in the posterior wing and a fringe of long hairs on R_{2+3} in the anterior wing.

Key to Species of *Bachorema*.

1. Posterior wing with apical forks nos. 1, 2, 3 and 5. . *B. obliqua* sp. n. (p. 494).
–. Posterior wing with apical forks nos. 2, 3 and 5 . . *B. gisba* sp. n. (p. 494).

Bachorema obliqua sp. n. (fig. 334).

Insect moderately small, brownish with mottled anterior wings. *Head* dark ochraceous with yellowish hairs. Oculi nearly black. Basal joint of the *antenna* of the same colour as the head, remaining joints paler. *Palpi* with the joints ochraceous and the points of articulation nearly white. *Legs* ochraceous ; fore leg mottled with darker colour. *Wings, anterior*, ochraceous with numerous dark, semi-recumbent hairs somewhat mottling the wing. Two clumps of black hair in the post-costal region near the base. A heavy downwardly directed fringe of long, fine hairs on the media on its under surface. A pouch, probably in the ♂ only, containing a very conspicuous pencil of yellow hairs in the region of the media. Forks nos. 1, 2, 3, 4 and 5 present, no. 4 sessile, the others with foot-stalks ; that of no. 3 short, about half the length of the fork. In the *posterior wing*, forks nos. 1, 2, 3 and 5 present, all with foot-stalks.

Genitalia, ♂.—Apical margin of the ninth tergite produced in a corneous dorsal plate, whose apex is further produced in a pair of strongly chitinized. downturned hooks ; at its base is a pair of warts, very short and sparsely fringed. Superior appendages moderately long, shorter than the dorsal plate, fringed. Penis short ; apex clavate ; no apparent sheaths or covers. Inferior appendages long and stout, with a short, slender branch or joint arising from the inner margin near the apex ; a few long spines arising from its inner surface. Short processes to the sixth and seventh sternites, that of the sixth bearing a few stout hairs. Lateral filaments of the fifth segment moderately long, transparent.

Length of the anterior wing, ♂, 6 mm.

AUSTRALIA : Queensland, National Park, 26.xii.1921, 1 ♂ (Tillyard Collection).

Bachorema gisba sp. n. (fig. 335).

Insect moderately small, of about the same size as *B. obliqua*. *Wings* mottled with brown and yellowish. In the undenuded *anterior wing* the pouch is less conspicuous than in *obliqua* owing to its being narrower and the pencil of hairs contained therein less strongly yellow. In this wing forks nos. 1, 2, 3, 4 and 5 present, no. 4 sessile, all the others with foot-stalks ; no. 3 with a foot-stalk about twice its own length, no. 5 with a very short foot-stalk. The pouch in the median region longer and thinner than in *obliqua*. A close, downwardly directed fringe of long hairs on the media on its under surface. In the *posterior wing* there is some irregularity in the region of the radius and sector resulting in the absence of fork no. 1. Forks nos. 2, 3 and 5 present, no. 5 with a somewhat shorter foot-stalk than in *obliqua*. The posterior wing is somewhat narrower in proportion to its length than is the case in *obliqua*.

Abdomen lacking in the type.

Length of the anterior wing, ♂, 6 mm.

AUSTRALIA : Victoria, Gisborne, 25.ii.1917, ♂, G. Lyall (Tillyard Collection).

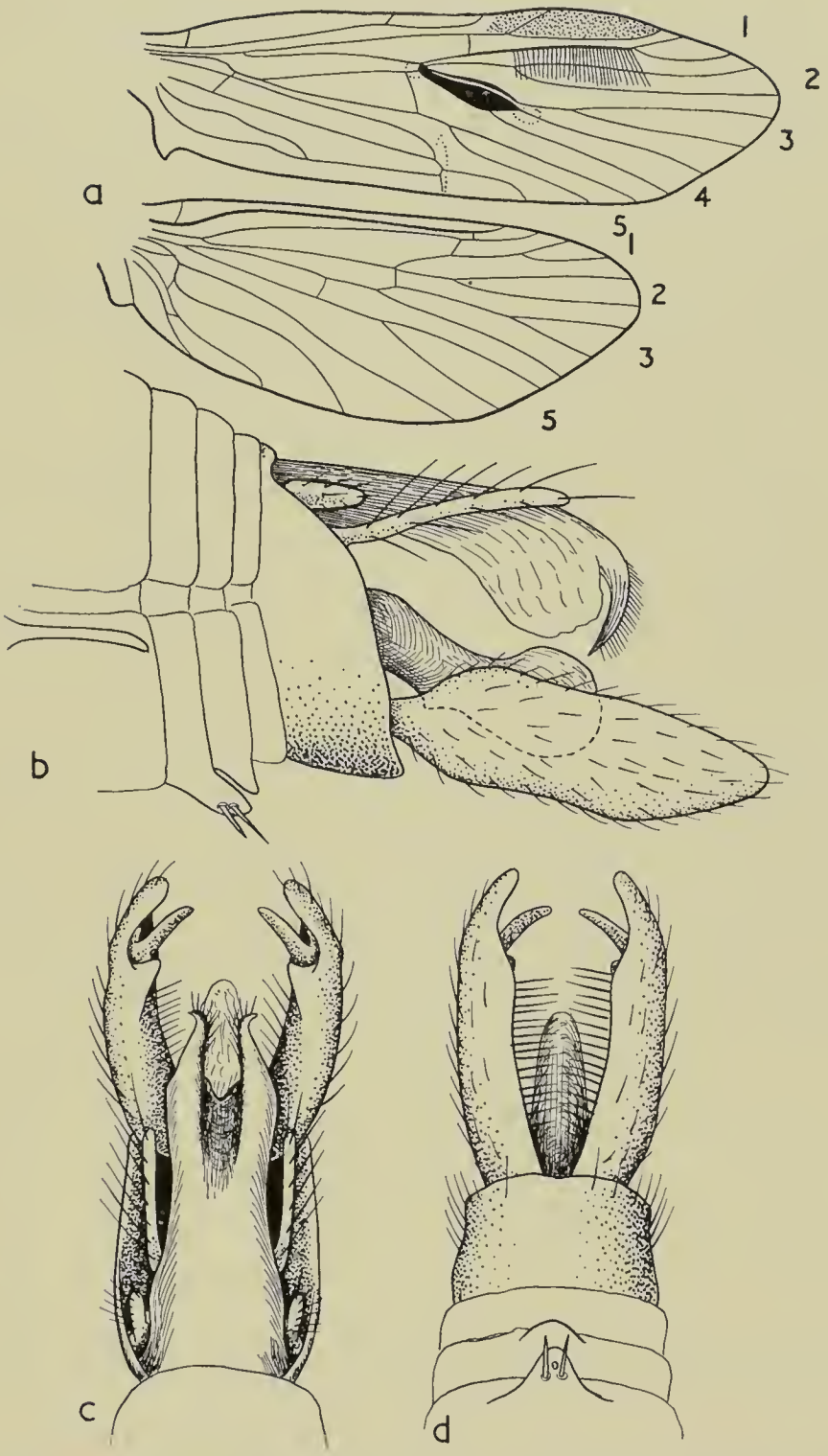

Fig. 334.—*Bachorema obliqua* gen. sp. n. ♂. *a*, wings; *b*, genitalia, lateral; *c*, dorsal; *d*, ventral.

It is unfortunate that the specimen is without abdomen, so that it has not been possible to give a description of the genitalia. The neuration

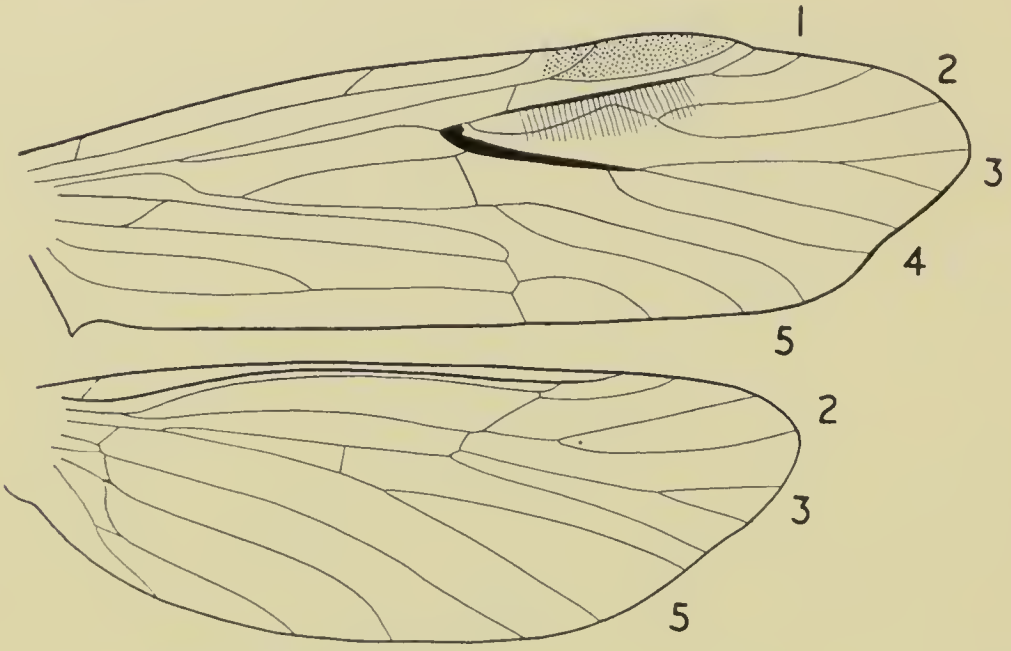

FIG. 335.—*Bachorema gisba* sp. n. ♂ wings.

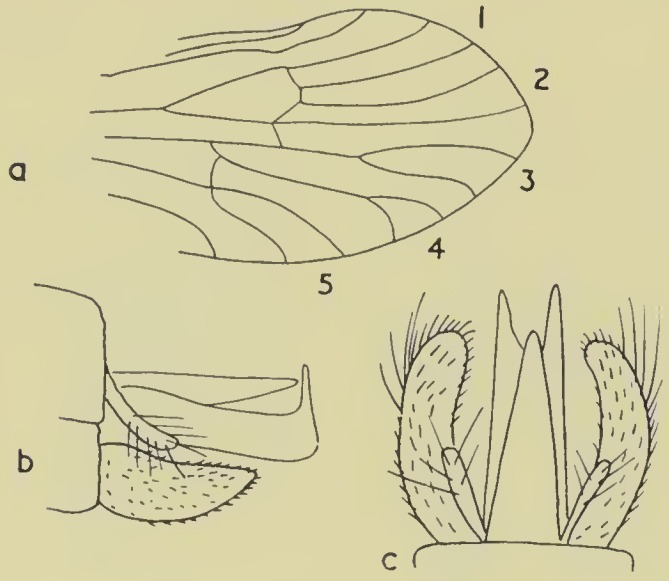

FIG. 336.—*Agapetus monticolus* Banks. ♂ (after Banks). *a*, apex of anterior wing; *b*, genitalia, lateral; *c*, dorsal.

distinguishes it from *obliqua*, and it is therefore probable that any future species in the genus that may be discovered will also be separable by this character.

Subfam. **GLOSSOSOMATINAE** Ulmer.

Ulmer, 1903, *Abh. Natur. Ver. Hamburg*, **18** : 128.
Ulmer, 1907, *Gen. Insect.*, **60a** : 210.

Spurs 2, 4, 4. *Intermediate tibia* and *tarsus* of ♀ generally strongly dilated. In *anterior wing* apical forks nos. 1, 2 3, 4 and 5 present. In *posterior wing* forks nos. 1, 2, 3 and 5 or 2, 3 and 5 present. Discoidal cell of anterior wing closed, open or closed in posterior wing.

Key to Genera.

1. Sub-costa of posterior wing distinct near the base, but soon merging into the costa . . . . . *Agapetus* Curtis (p. 497).
–. Sub-costa of posterior wing joining the costa beyond the middle of the wing *Synagapetus* McLachlan (p. 498).

Agapetus Curtis.

Agapetus Curtis, 1834, *Lond. and Edinb. Phil. Mag.* (3) **4** : 217.
Agapetus Ulmer, 1907, *Gen. Insect.*, **60a** : 213.

Spurs 2, 4, 4, stout and short. *Intermediate tibia* and *tarsus* of the ♀ strongly dilated. *Antennae* stout. *Maxillary palpi*, first and second joints very short ; second shorter than the first and globular ; third rather longer than the first two united ; fourth about as long as the first ; fifth slightly longer than the fourth.

Anterior wing densely pubescent. Apical forks nos. 1, 2, 3, 4 and 5 present. Discoidal cell present. *Posterior wing* shorter and much narrower than the anterior. Apical forks nos. 2, 3 and 5 present. Discoidal cell wanting. Costal margin slightly elevated near the base. Sub-costa rudimentary, distinct near the base but soon merging into the costa. Radius running very close to the costa and often terminating in a small apical fork which is unstable, and may be present or absent in individuals of the same species.

In the ♂ there is a lateral plate on each side of the fifth abdominal segment. A large process on a false suture on the sixth ventral segment and generally a tuft of hairs on a false suture on the seventh.

The abdomen of the ♀ terminates in a long ovipositor.

Type species.—*Agapetus fuscipes* Curtis, 1834 (by designation of Curtis, 1837).

Agapetus monticolus Banks (fig. 336).

Agapetus monticolus Banks, 1939, *Bull. Mus. Comp. Zool. Harv.*, **85** : 503–504, figs. 56. 59, 64.

Banks describes the species as follows :

" Head black, some long, upcurved, white hairs on lower face, and a few above ; palpi and antennae dark ; thorax black, white hairs from prothoracic warts, dark hairs from near base of fore wing ; abdomen dark brown. Wings black, with black hair and fringes, veins brown. "

" In fore wings discal cell is more than twice as long as broad, forks one and two both broad on discal cell, latter obliquely so, fork three much longer than its pedicel, fork four short, not one-half its pedicel, fork five long, back to the cross-vein."

" In hind wings fork two more than one-half its pedicel, fork three nearly equal its pedicel, fork five back to forking of medius."

" Male genitalia show a superior median tapering piece, and each side a short very slender, bristly piece, the intermediate pieces project beyond all others and have the sharp point abruptly upturned, the claspers are broad, from side nearly pointed at tip. From the sixth ventral segment is a stout curved process, neither pointed nor broadened at tip."

" Fore wing, 3·5 mm. long."

" From Mt. Kosciusko, New South Wales, Australia, 4 to 6000 ft., 10–12 Dec. (Darlington)."

Type in the Museum of Comparative Zoology, Harvard College, U.S.A.

Synagapetus McLachlan.

Synagapetus McLachlan, 1879, *Rev. and Syn. Trich.*, : 484.
Synagapetus Mosely, 1935, *Ann. Mag. N.H.*, (10) **16** : 304.

Spurs 2, 4, 4. *Intermediate tibia* and *basal joint of tarsus* of ♀ more or less dilated according to species. *Ocelli* small. *Antennae* stout, basal joint stouter than the others. *Maxillary palpi* rather stout. Basal two joints very short, second shorter than the first, globular ; third long ; fourth about as long as the first and second together ; fifth slightly longer than the fourth. *Abdomen* with a process to the sixth sternite in the ♂, with an additional process to the eighth sternite in the ♀. A lateral valve to the fifth sternite in each sex. *Anterior wing* clothed with dense pubescence, long and narrow. Forks nos. 1, 2, 3, 4 and 5 present ; sub-costa of the *posterior wing* joining the costa beyond the middle of the wing (thus differing from *Agapetus*, in which, in this wing, the sub-costa is so short as to be almost rudimentary). Apical forks nos. 1, 2, 3 and 5 or 2, 3 and 5 present in posterior wing. *Genitalia*, ♂, always with a pair of large, stout inferior appendages ; in the ♀ the abdomen is produced in a long, retractile ovipositor terminating in a pair of slender, two-jointed filaments.

Type species.—*Synagapetus dubitans* McLachlan, 1879.

KEY TO SPECIES OF *Synagapetus*, MALES.

1. Superior appendage deep and narrow ; inferior appendages from beneath with a deep, narrow, parallel-sided excision between them
   S. tasmanicus sp. n. (p. 498).
–. Superior appendage short and somewhat elavate ; inferior appendages from beneath separated by a V-shaped excision . . . . . 2.
2. Upper penis-cover from side with its upper margin humped at the base ; inferior appendages from beneath with inner margins sinuous . *S. crata* sp. n. (p. 500).
–. Upper penis-cover from side with upper margin only slightly convex, not humped ; inferior appendages with inner margins nearly straight *S. pontona* sp. n. (p. 500).

Synagapetus tasmanicus sp. n. (fig. 337).

Insects small and dark. *Median leg* of ♀ considerably dilated. *Neuration* as figured.

Genitalia, ♂.—Joined to the ninth segment is a large, strongly chitinized

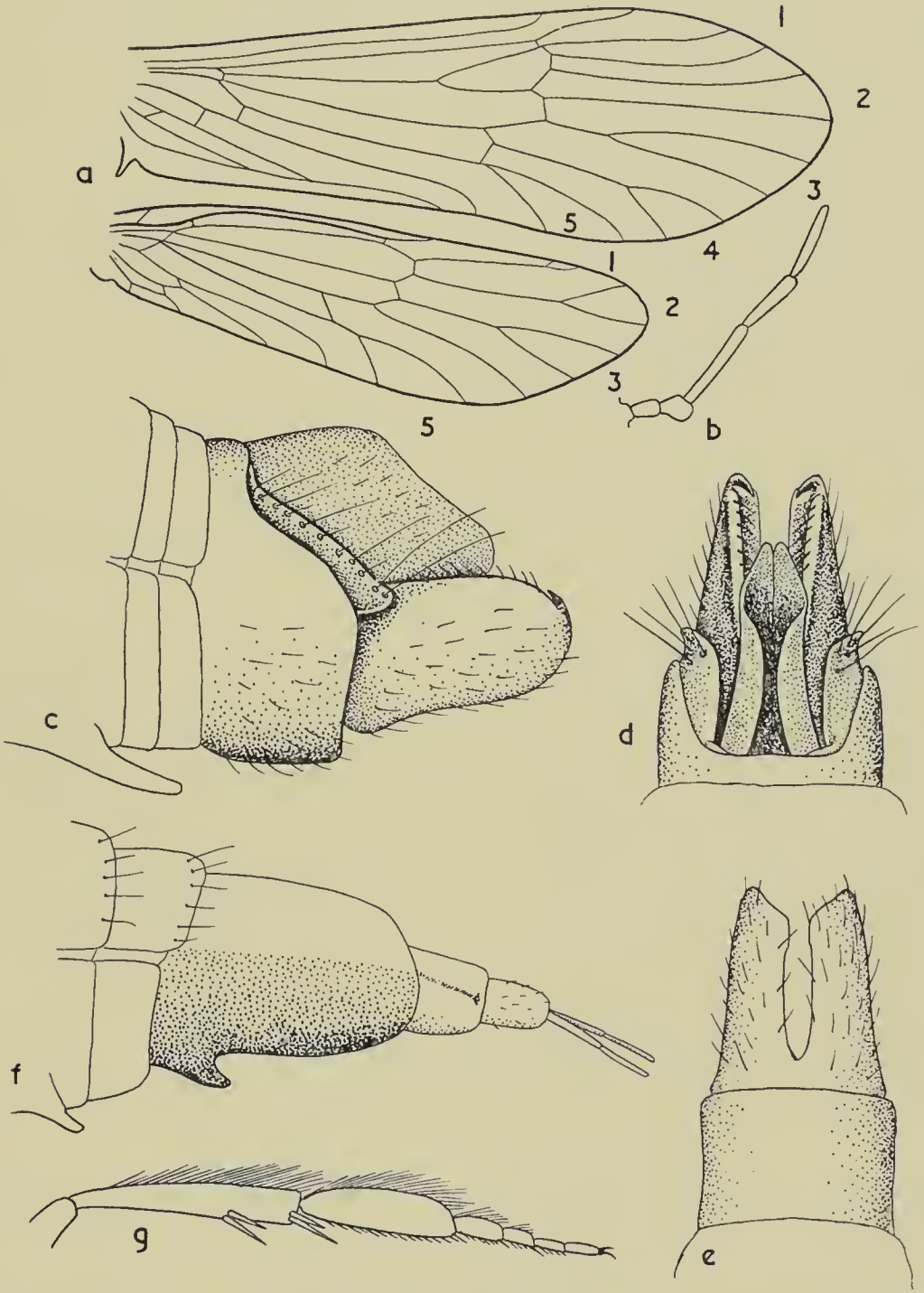

FIG. 337.—*Synagapetus tasmanicus* sp. n. *a*, ♂ wings; *b*, ♂ maxillary palpus; *c*, ♂ genitalia, lateral; *d*, dorsal; *e*, inferior appendages, ventral; *f*, ♀, apex of abdomen, lateral; *g*, ♀ median leg.

upper penis-cover (?), divided dorsally at the centre with the margins of the excision out-turned, and with a very oblique apical margin. Lying close along the basal margins of the cover is a pair of long and stout superior appendages. Penis obscure, retracted. No visible lower penis-cover or sheaths. Inferior appendages very large, oblong; apex bluntly rounded and bearing on its apical margin, arising at about midway, a small, black, up-turned and slightly inturned hook.

Genitalia, ♀.—Abdomen produced and tapering to a pair of two-jointed filaments, as is usual in the genus. A small process to the sixth sternite and a large one to the eighth, which is strongly chitinized. There is no apparent pleurite to the eighth segment.

Length of anterior wing, ♂, 3·5 mm.; ♀, 4 mm.

Tasmania: New Norfolk, iii.1938, numerous ♂♀, J. W. Evans; Port Arthur, 2.ii.1933, 2 ♂, R. J. Tillyard.

Type, ♂ (New Norfolk), mounted as a microscope preparation.

Synagapetus crala sp. n. (fig. 338).

The colour of the insect and its wings is dark ochraceous. The *neuration* is practically the same as that of *S. tasmanicus* but there are slight differences in the *genitalia*, as may be seen from the figures.

Genitalia, ♂.—The general construction conforms with that of *tasmanicus* and *pontona*. The upper penis-cover shows little difference, excepting that the upper margins are not turned over and are rather more humped at the base. The superior appendages are more clavate than in *pontona*, which it more nearly resembles. The penis is similar in form to that of *pontona*, with the sheaths more in evidence. The main difference lies in the inferior appendages. The upper margin, from the side, is flat, convex in *pontona*, whilst, from beneath, the margins are sinuous so that there is a wide separation between the two at their distal ends, narrowing rather abruptly to a narrow cleft at the base. The ridge of black teeth in *pontona* is replaced by a single black tooth near the apex connected to the lower margin by an oblique, blackened line.

Length of the anterior wing, ♂, 4 mm.

Tasmania: Cradle Mts., 21.i.1917, 1 ♂, R. J. Tillyard.

Type with abdomen mounted in canada balsam.

Synagapetus pontona sp. n. (fig. 339).

This insect closely resembles *Synagapetus tasmanicus* both in neuration and genitalia. It is somewhat lighter in colour. One of the main differences lies in the form of the superior appendages. Nearly all the material in the British Museum (N.H.) is from New South Wales, but one example was taken in Victoria.

Genitalia, ♂.—From above, the apical margin of the ninth segment is widely excised. Joined to the base of the excision is a large upper penis-cover, cleft down the centre, with the upper edges slightly turned over and inwards. From the side, the plate is deep, quadrate with obliquely truncate

apical margin. Superior appendages from the side, short and stout, directed slightly downward. Penis long, with a pair of spine-like sheaths, covered by the upper penis-cover. Inferior appendages large and stout. Upper margin strongly convex ; apical margin without the inturned hook of *tasmanicus*, but

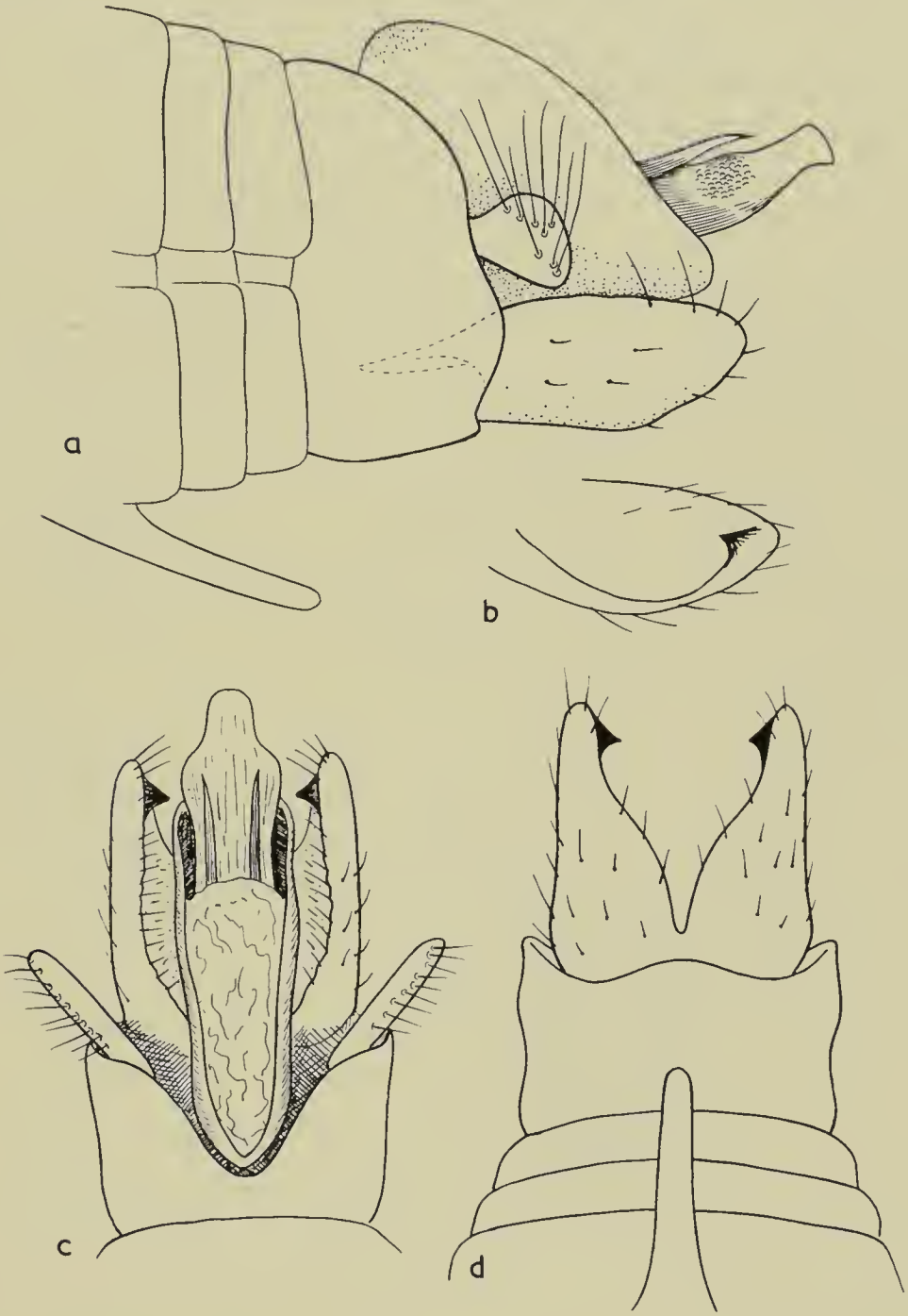

FIG. 338.—*Synagapetus crala* sp. n. ♂ genitalia. *a*, lateral ; *b*, inferior appendage from within ; *c*, dorsal ; *d*, inferior appendages, ventral.

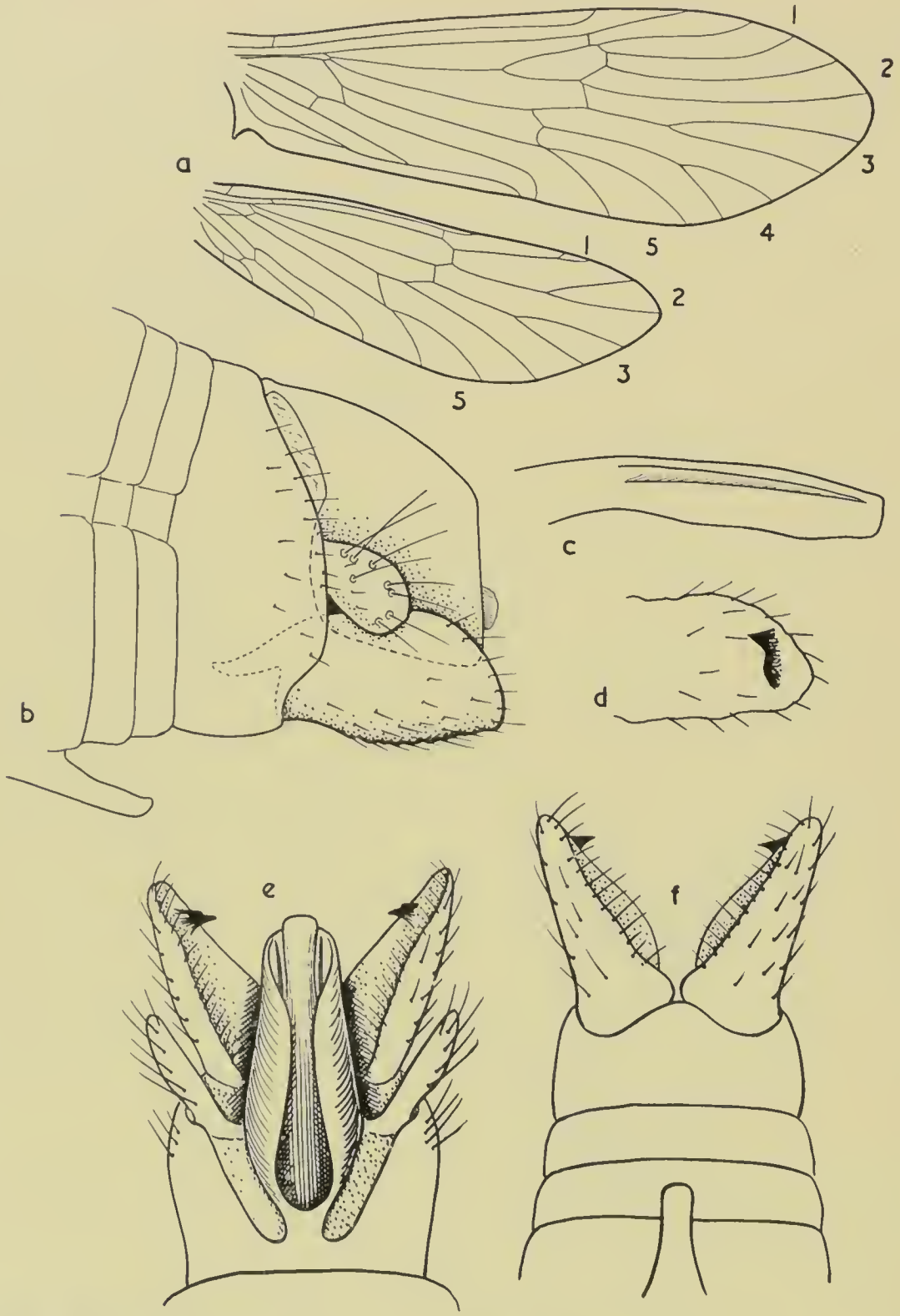

FIG. 339.—*Synagapetus pontona* sp. n. ♂. *a*, wings; *b*, genitalia, lateral; *c*, penis and sheath, lateral; *d*, inferior appendage from within; *e*, genitalia, dorsal; *f*, inferior appendages, ventral.

with a strong, black spur enlarged sometimes to a short ridge on the inner surface near the apex. From beneath, the inner margins of the appendages are straight. A strong process to the sixth sternite.

Length of the anterior wing, ♂ and ♀, 4·5 mm.

Australia : New South Wales, Hampton, i.1918, 4 ♂, 2 ?, R. J. Tillyard ; Ebor, i.1916, 6 ♂, 1 ♀ ; Bathurst, 2300 ft., 8.ii.1884, 1 ♂. Victoria, Fernshaw, 21.xii.1884, 1 ♀.

Type, ♂ (Hampton), mounted in canada balsam.

17. Fam. **HYDROPTILIDAE** Stephens.

Stephens, 1836, *Ill. Brit. Ent. Mand.*, **6** : 151.
Ulmer, 1907, *Gen. Insect.*, **60a** : 217.

Spurs 0, 2, 4 or 0, 3, 4. *Antennae* stout, shorter in the ♀ than in the ♂. Basal joint not so long as the head. *Ocelli* present or absent according to genus. *Maxillary palpi* with the first and second joints very short. *Wings* long and slender, apices generally acute. *Anterior* densely pubescent, furnished with numerous semi-erect hairs. *Posterior* always narrower than the anterior. Fringes in both wings very long, particularly so in the posterior, where they are much longer than the greatest width of the wing. *Neuration* very irregular and difficult to make out, particularly the transverse nervules. An attempt has been made to name the apical forks in the various genera, but it must be admitted that the interpretation of the neuration is somewhat a matter for conjecture. In the *abdomen* there are generally lateral filaments arising from minute processes on the fifth segment. The ♂ *genitalia* are generally quite distinctive, although it is usually necessary to make a microscopical examination of them to make out their structure with certainty.

These minute insects are difficult to determine when pinned and, although in this condition certain species may sometimes be recognized, it is perhaps better to make a practice of collecting them in fluid. It should be impressed upon the student that an examination of the genitalia is essential for the separation of the species, and that such interesting features as the scent-organs in the genus *Hydroptila* can never be observed when the material is dry.

Key to Genera of *Hydroptilidae*.

1. Spurs 1, 2, 4 . . . . . *Zelandoptila* Tillyard (p. 504).
–. Spurs other than 1, 2, 4 . . . . . 2.
2. Spurs 0, 2, 4 . . . . . 3.
–. Spurs 0, 3, 4 . . . . . 4.
3. Ocelli absent. Scent-organ caps present on head of ♂. In anterior wing, Cu_1 and Cu_2 are fused before reaching wing margin. Forks nos. 1, 2 and 3 in anterior wing ; fork no. 2 generally present (though small) in posterior wing . . . . . *Hydroptila* Dalman (p. 505).
–. Ocelli present. No scent-organ caps on head of ♂. In anterior wing Cu_1 and Cu_2 run separate to the wing margin. Forks nos. 1 and 2 in anterior wing and 2 and 5 present in posterior wing . . *Orphninotrichia* Mosely (p. 510).
4. Posterior wing with apex very attenuate ; Rs not forked *Oxyethira* Eaton (p. 511).

-. Posterior wing not very attenuate at apex ; Rs forked . . . . . 5.
5. Posterior wing with forks nos. 1 and 2 present, ♂ with processes on seventh and eighth sternites . . . . . *Paroxyethira* Mosely (p. 515).
–. Posterior wing with no apical forks ; ♂ with process on the seventh sternite only . . . . . *Xuthotrichia* Mosely (p. 518).

Zelandoptila Tillyard.

Zelandoptila Tillyard, 1924, *Trans. N. Zeal. Inst.*, 55 : 300, text-fig. 15.

Tillyard describes the genus as follows :

" Wings long and narrow, with long fringes, fringe of hindwing basally somewhat longer than width of wing itself. Se short in forewing, long and close to costa in hindwing. R_1 thickened in both wings, but terminating about halfway along hindwing by turning down to join R_{2+3}. A long, narrow triangular pterostigma strongly developed in forewing. Forewing with apical forks 2, 3, 4 and 5 present, hindwing with 2, 3 and 5 : no closed cells in either wing, and no cross-veins except a faint indication of one below stigma in forewing and one between Cu_2 and 1A in hindwing. Anal area very narrow, much reduced in hindwing, where Cu_2 ends well before half-way, 1A at about one-fifth, 2A half-way along 1A, and 3A appears to be absent. Tibial spurs apparently 1, 2, 4. Female with end of abdomen extended into a long and very slender ovipositor."

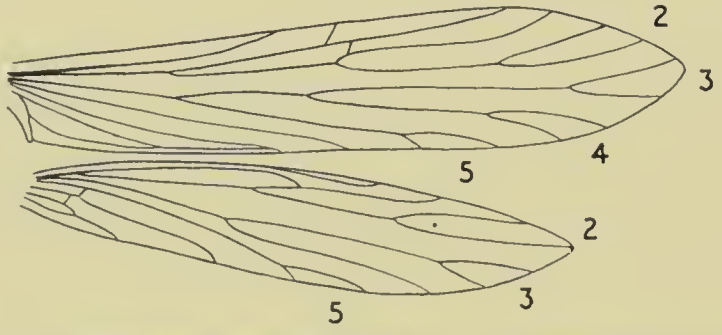

Fig. 340.—*Zelandoptila moselyi* Tillyard. ♀ wings (after Tillyard).

Type species.—*Zelandoptila moselyi* Tillyard, 1924.

Zelandoptila moselyi Tillyard (fig. 340).

Zelandoptila moselyi Tillyard, 1924, *Trans. N. Zeal. Inst.*, 55 : 301, text-fig. 15.

Tillyard describes the species as follows :

" ♀ Total length, 4·5 mm., inclusive of the very slender ovipositor, 1·5 mm. long ; forewing, 4·8 mm. ; expanse, 10·5 mm."

" *Head* dark brown, with pale hairs : eyes greyish-black : antennae about three-fourths as long as forewing, pale testaceous, strongly annulated with dark bands on each segment ; palpi testaceous, darker basally."

" *Thorax* dark brown. Legs—coxae reddish-brown, rest testaceous."

" *Wings*.—Forewing a medium fuscous, with abundant soft horizontal hairs of dark colour, and also numerous upright pale-golden hairs. Base of pterostigma dark, but distal two-thirds pale, with pale hairs above it along costa. Fringe inclined

to pale golden along termen, but dull-coloured elsewhere. Hindwing somewhat infuscated, with fuscous veins and fringe."

"Abdomen blackish-brown; ovipositor semitransparent testaceous, carrying a few stiff hairs, and with the two elongate gonapophyses at extreme end, exceedingly minute."

"*Type*.—Holotype female, unique, [New Zealand], Tokaanu, Lake Taupo, North Island (24th November, 1919, R. J. T.); in Cawthron Institute collection."

Hydroptila Dalman.

Hydroptila Dalman, 1819, *K. Sv. Vet. Akad. Handl.*, **40** : 125.
Phrixocoma Eaton, 1873, *Trans. ent. Soc. Lond.*, **1873** : 132.
Hydroptila Ulmer, 1907, *Gen. Insect.*, **60a** : 222.

Spurs 0, 2, 4. *Ocelli* absent. *Head* above very hairy, with a pair of large caps or lobes at the back, which in some species, in the ♂ sex only, cover eversible filaments, either two or four in number; in others they are lined with a membrane bearing minute androconia, and are accompanied by a pair of tufts of specialized scent-hairs, arising from the head at their bases. This complicated apparatus no doubt functions as a scent-organ.

Antennae very thick, with groups of joints covered with light-coloured hairs alternating with other groups covered with dark hairs. Antennae always shorter in the ♀.

Anterior wing lanceolate, subacute, the apex not greatly produced. Fringes of the *posterior wing* more than twice the greatest width of that wing. *Neuration* rather obscure in both wings, but in the anterior wing forks nos. 1, 2 and 3 appear to be present, while in the posterior there is generally a very small fork no. 2 and no other apical forks.

Type species, *Hydroptila tineoides* Dalman, 1819.

Key to Species of *Hydroptila*, Males.

1. Inferior appendage from side truncate at apex, without socketed teeth on its outer surface, but with two blackened tooth-like projections
H. losida sp. n. (p. 505).
–. Inferior appendage from side rounded or acute at apex, with numerous socketed teeth or spines on outer surface . . . . . 2.
2. Inferior appendage from side curving downward in apical half; apex rounded
H. incertula Mosely (p. 507).
–. Inferior appendage from side with apex acute and slightly upcurved
H. tasmanica Mosely (p. 509).

Hydroptila losida sp. n. (figs. 341, 342).

Antennae about 33-jointed in the ♂. *Neuration* as figured. *Head* with two scent-organ caps but scent-organs either absent or else very obscure. The caps are peculiar in form, resembling those of *tasmanica*. They are erectile, and each margin is produced in a minute, blunt hook at the point where they meet in a recumbent position.

Genitalia, ♂.—From above, the distal margin of the ninth segment is

produced and rounded. Beyond it is the dorsal plate ; this consists of two narrow, divergent arms beneath which is a transparent, membranous plate, somewhat shorter than the arms and with a truncate distal margin. From the side, the ninth segment is deeply excised and there are no side-pieces. The dorsal plate, from this aspect, is beak-shaped, with a rounded expansion towards the base of the lower margin. Penis with a single, widely divergent sheath considerably protruded in the two examples obtained. Lower penis-cover long, broad at the base, tapering to a narrow, truncate apex. Inferior appendages large, with two strong, blunt teeth on the outer margin, one, the

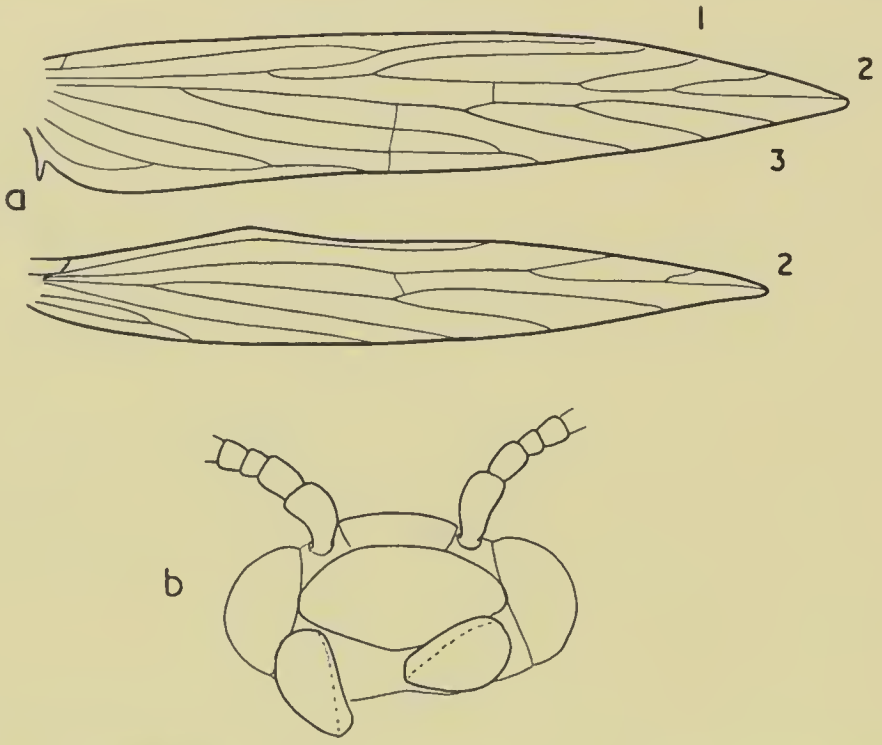

Fig. 341.—*Hydroptila losida* sp. n. ♂. *a*, wings ; *b*, head from above, one scent-organ cap raised.

larger, near the apex, the other towards midway. From the side, the appendages are seen to arise from a narrow stem and are broadened in a quadrate mass, bearing the two teeth and numerous thorn-like hairs on the outer surfaces. A small process to the seventh sternite.

Length of the anterior wing, ♂, 3 mm.

Australia : Queensland, Eidswold, 2 ♂.

Type, ♂, and paratype, ♂, in the collection of the C.S.I.R., Canberra, Australia.

This insect bears a close resemblance to *H. tasmanica*, but with the neuration of the posterior wing conforming more closely with the usual *Hydroptila* pattern than in that species. The remarks which I have made about the generic position of *tasmanica* apply equally to *losida*.

Hydroptila incertula Mosely (fig. 343).

Hydroptila incertula Mosely, 1934, *Trans. R. Ent. Soc. Lond.*, **82** : 145–147.

Head partly destroyed. *Antennae* 30-jointed. *Palpi* missing. *Wings* rather more pointed than in the European species.

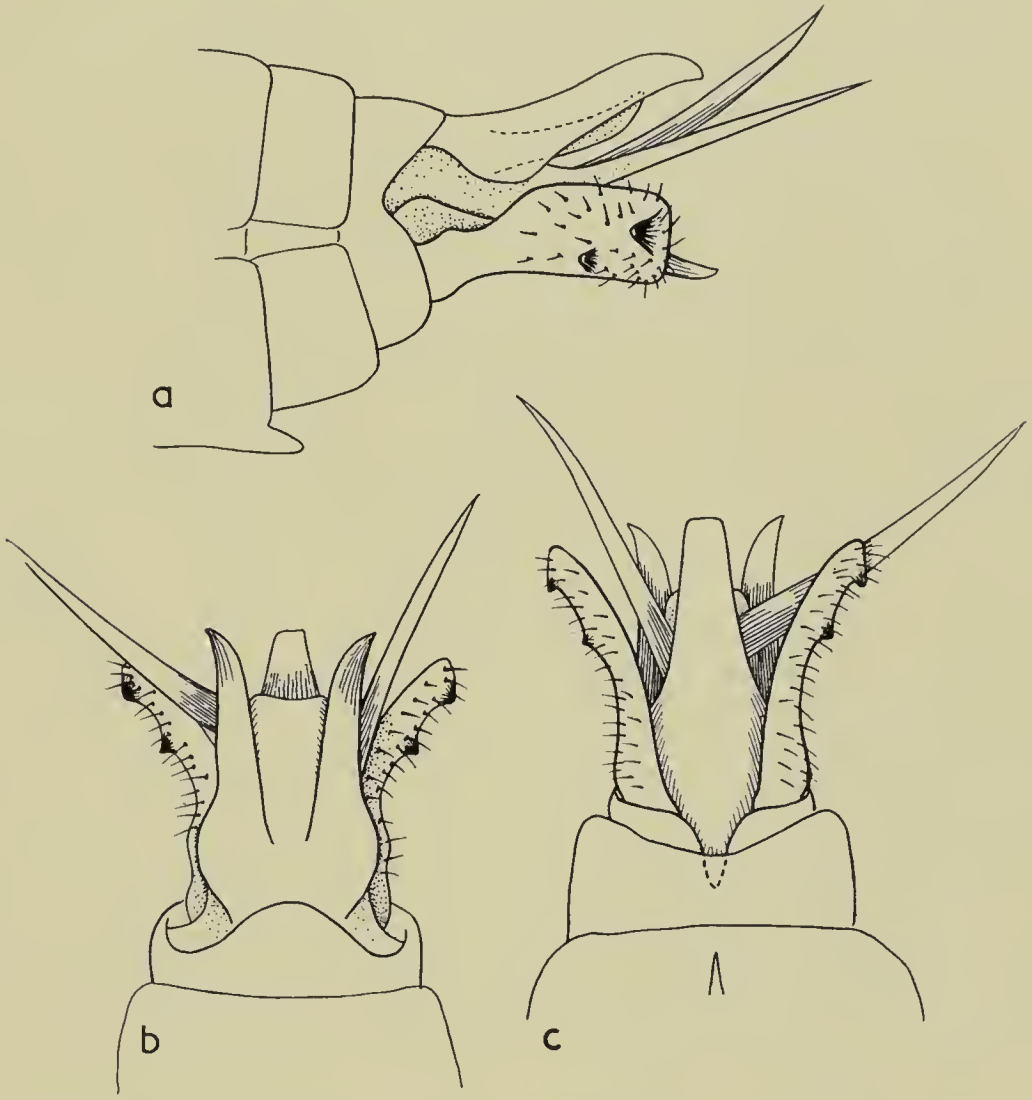

Fig. 342.—*Hydroptila losida* sp. n. ♂ genitalia. *a*, lateral ; *b*, dorsal ; *c*, ventral.

Genitalia, ♂.—The margin of the terminal segment is produced in an acute triangle ; beneath it is a lightly chitinized plate, the apex of which is cut out in a deep U-shaped excision, in the centre of which may be seen a membranous plate, probably an upper penis-cover, with excised apical margin. Beneath this is the penis with a hook towards the apex, bent to the left at right-angles. Beneath the penis is a membranous lower penis-cover, with a short ventral keel carrying two strong spines projecting laterally. Inferior appendages

large, somewhat dilated at the apices, which are furnished with stout, outwardly directed, peg-like spurs. Seen from the side, towards the base, along

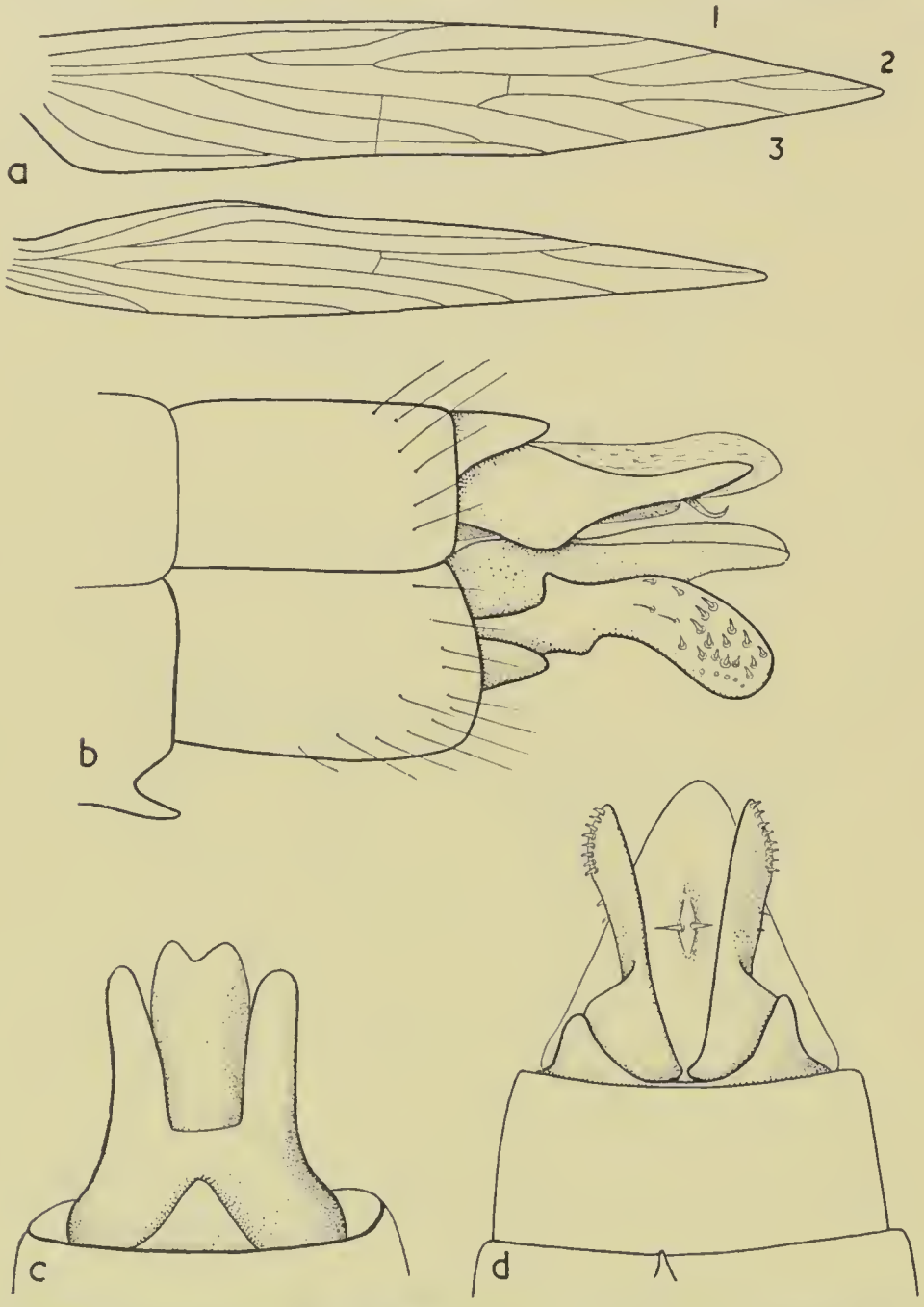

Fig. 343.—*Hydroptila incertula* Mosely. ♂. *a*, wings; *b*, genitalia, lateral; *c*, dorsal; *d*, ventral.

both the upper and the lower margins are two angular projections opposite each other. The margin of the ninth ventral segment is cut away in a deep, semicircular excision. A short process to the seventh sternite.

Length of the anterior wing, ♂, 2·5 mm.

AUSTRALIA : Brisbane.

Type mounted in balsam.

There are several females labelled Brisbane, some of which may belong here. I have, with some hesitation, placed this species in *Hydroptila*. Unfortunately the head of the single ♂ has been partly destroyed, so that I am unable to ascertain whether scent-organs are present or not.

Hydroptila tasmanica Mosely (fig. 344).

Hydroptila tasmanica Mosely, 1934, *Trans. R. Ent. Soc. Lond.*, 82 : 147–149.

Head dark fuscous, bearing two wide and rather shallow scent-organ caps at the back. *Antennae* 29-jointed in the ♂, pale fuscous. *Wings* long and very acuminate at the apices. *Anterior*, light fuscous with a white patch along the fringe towards the apex, remainder of the fringe fuscous ; *posterior wing* light fuscous. *Palpi* and *legs* light fuscous.

There are two females in the collection from the same locality, taken on the same date, which may, perhaps, be associated with this species. In these the basal joints of the *antennae* are pale ; then there is a long, dark, fuscous stretch, then a short, pale stretch, and finally, the few apical joints are dark.

Genitalia, ♂.—The anterior margin of the ninth dorsal segment is strengthened with a strongly chitinized band which is divided at the centre by a vertical, impressed line (not shown in the figure in order to avoid confusion of detail). From the side the apical margin is strongly excised. There is a long, bifurcate dorsal plate, broad at the base, each fork dilated at its obliquely truncate apex. At the base of the plate, along the lateral margins, there are slight angular projections. From the side, the upper and lower margins are sinuous. Penis very long and slender, without the right-angled bend that is so frequently found in *Hydroptila* species. Beneath the penis is a broad lower penis-cover with the apical margin produced at the centre in a slender finger. Inferior appendages large. From the side, with the upper margin sinuous and set with short, broad teeth ; it bears a black wart or rudimentary spur near the lateral margin towards the apex. From beneath the margin of the eighth sternite is deeply excised. Ventral process of the seventh sternite very small.

Length of the anterior wing, ♂, 3 mm.

TASMANIA : Wilmot, 9.i.1917.

Type in the British Museum (N.H.).

The shape of the wings of this species hardly conforms to the pattern in the genus, so that it will be necessary to extend the generic characters to cover this extreme form. The structure of the genitalia and other characters, absence of ocelli, spurs, etc., show that it is correctly placed in *Hydroptila*, and it is possible that a reduced form of scent-organ is concealed beneath the scent-organ caps. Unfortunately it is not possible to make this out clearly in the single complete male head available.

Orphninotrichia Mosely.

Orphninotrichia Mosely, 1934, *Trans. R. Ent. Soc. Lond.*, 82 : 138–139.

The *wings* are rather broad at the base and acuminate at the apices.

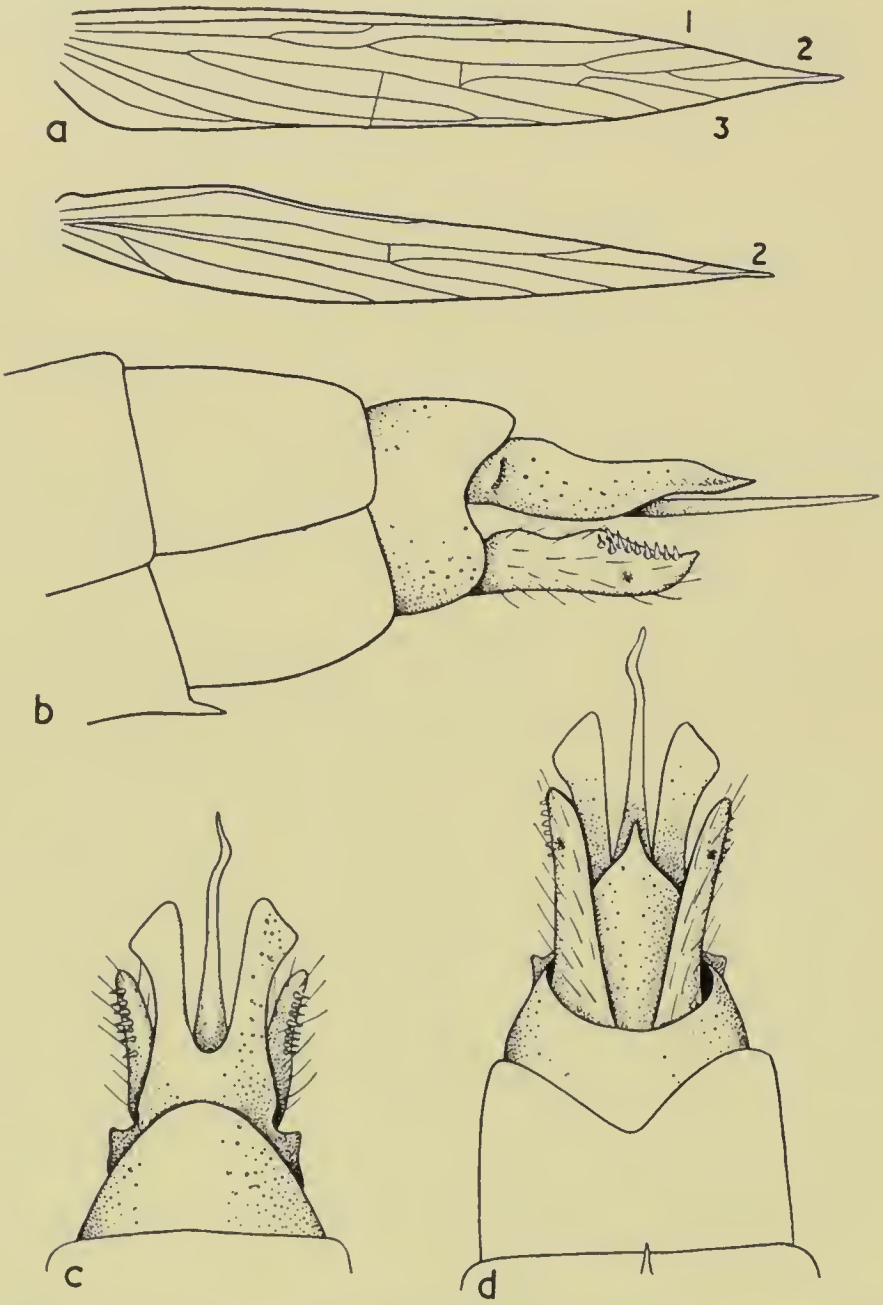

Fig. 344.—*Hydroptila tasmanica* Mosely. ♂. *a*, wings ; *b*, genitalia, lateral ; *c*, dorsal ; *d*, ventral.

Apical forks nos. 1 and 2 in *anterior wing*, nos. 2 and 5 in *posterior*. *Ocelli* present. *Antennae* 32-jointed, rather stout ; basal joints scarcely longer than the others. *Maxillary palpi* as is usual in the family with the first and second

joints very short ; third, fourth and fifth of about equal length. Labial palpi rather broad. *Spurs* 0, 2, 4. There is a short process to the seventh ventral segment.

Type species.—*Orphninotrichia maculata* Mosely, 1934.

The genus was erected to take a single Australian species in which the neuration differs considerably from that of all other Hydroptilid genera, as may be seen on reference to fig. 345.

Orphninotrichia maculata Mosely (fig. 345).

Orphninotrichia maculata Mosely, 1934, *Trans. R. Ent. Soc. Lond.*, **82** : 139.

Head very dark fuscous. *Antennae* 32-jointed, dark fuscous. *Legs* fuscous. *Wings*, both *anterior* and *posterior*, dark fuscous ; *anterior* with a small patch of snow-white hairs on the post-costal margin about midway, extending into the fringe. There are a few dark spots scattered over the wing ; extreme apex black ; fringes fuscous.

Genitalia, ♂.—Apical margin of the ninth segment deeply excised nearly to the base with a heart-shaped excision. The segment, from above, is consequently bifurcate, each branch truncate and sinuous at its apex with the inner apical angle somewhat produced. Outer margins of the segment straight. From the side, the outer margin is deeply excised in its lower half. From above, in the excision of the segment may be seen a semi-transparent, triangular upper penis-cover, apex produced and pointed. Beneath this is a long and slender penis, considerably protruded, with a dilated and bifurcate apex. Beneath the penis is a lower penis-cover consisting of a pair of large, strongly chitinized processes, from the side with rounded, hooked and down-turned apices ; from beneath, the apices are broadly and obliquely truncate and fringed with strong hairs. Margin of the eighth ventral segment with three acute excisions so that there are two triangular projections formed at its centre ; from the side, the lower margin of the segment is strongly produced, and the whole ventral segment is rather more strongly chitinized than is usual. A short acute process to the seventh ventral segment.

Length of the anterior wing, ♂, 2·5 mm.

Australia : New South Wales, Hornsby, 31.viii.1916, R. J. Tillyard.

Type, ♂, mounted in balsam but with the wings mounted dry, now in the British Museum (N.H.).

Oxyethira Eaton.

Eaton, 1873, *Trans. ent. Soc. Lond.*, **1873** : 143.
Ulmer, 1907, *Gen. Insect.*, **60a** : 226.

Spurs 0, 3, 4. *Ocelli* present. *Wings* long and extremely slender. Apices narrowly produced and acute. Fringes very long. *Neuration* rather reduced by compression. In *posterior wing* Rs runs unforked to the wing-margin.

Type species.—*Hydroptila costalis* Curtis, 1834 (by designation of Ross. 1944).

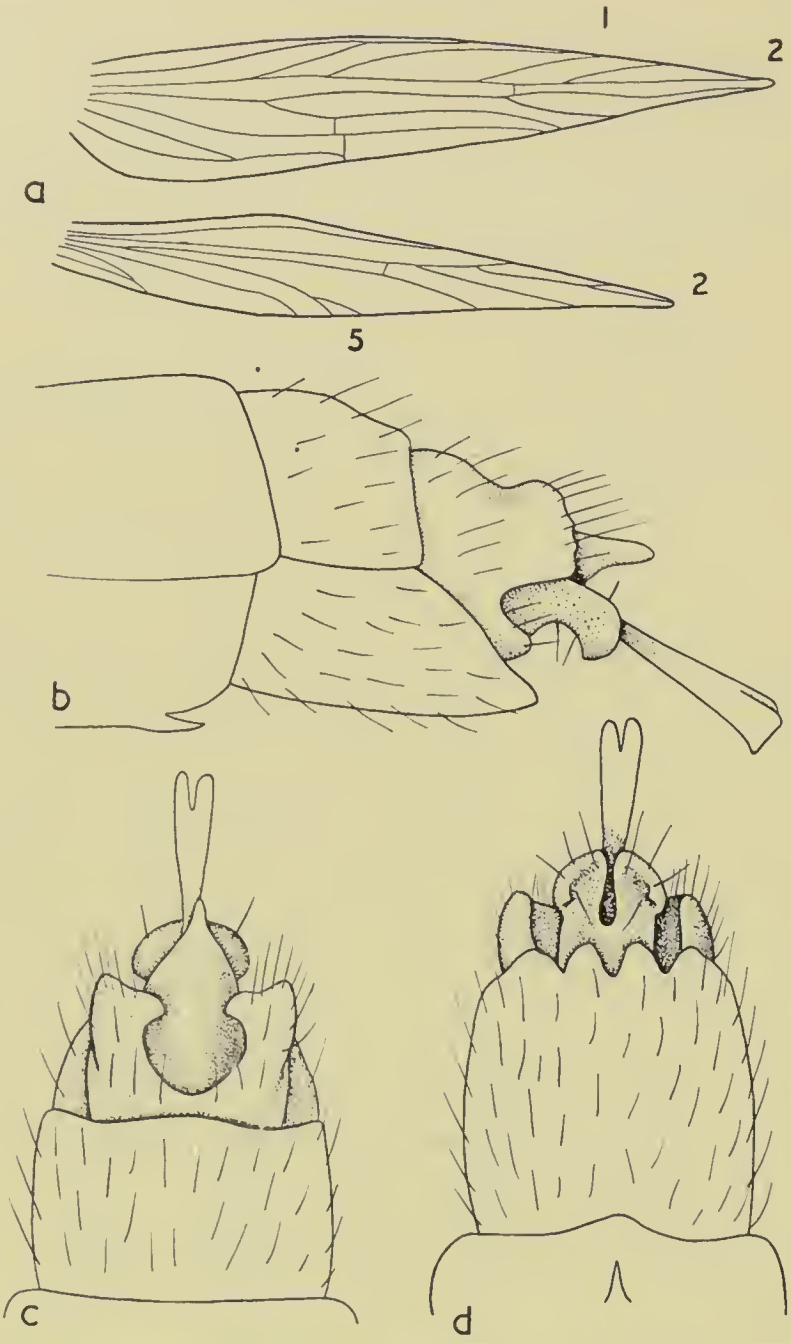

FIG. 345.—*Orphninotrichia maculata* Mosely. ♂. *a*, wings; *b*, genitalia, lateral; *c*, dorsal; *d*, ventral.

Oxyethira albiceps (McLachlan) (fig. 346).

Hydroptila albiceps McLachlan, 1862, *Trans. Ent. Soc. Lond.*, (3) **1** : 304.
Oxyethira albiceps Eaton, 1873, *Trans. Ent. Soc. Lond.*, **1873** : 145.
Oxyethira albiceps McLachlan, 1873, *Ann. Mag. Nat. Hist.*, (4) **12** : 42.
Oxyethira albiceps Hudson, 1885, *Trans. N. Zeal. Inst.*, **18** : 213, pl. 9, figs. 1–3.
Oxyethira albiceps Hutton, 1899, *Trans. N. Zeal. Inst.*, **31** : 249.

Oxyethira albiceps Hudson, 1904, *N. Zealand Neur.* : 90, pl. 11, figs. 1–3.
Oxyethira albiceps Ulmer, 1907, *Gen. Insect.*, 60a : 227.
Oxyethira albiceps Mosely, 1924, *Trans. N. Zeal. Inst.*, 55 : 673, figs. 13–15.

McLachlan describes the species as follows :

" *Male.*—Antennae grey, faintly annulated with darker; head clothed with dense greyish-white pubescence ; thorax fuscous ; abdomen brown above, silvery beneath ; legs pale grey ; anterior wings dark greyish-fuscous, irrorated with pale grey, the extreme apex conspicuously whitish ; posterior wings pale grey, the cilia concolorous."

" Long. corp. 1 lin. ; exp. alar. $2\frac{1}{4}$ lin."

" *Habitat*, New Zealand. In Mr. Dale's collection."

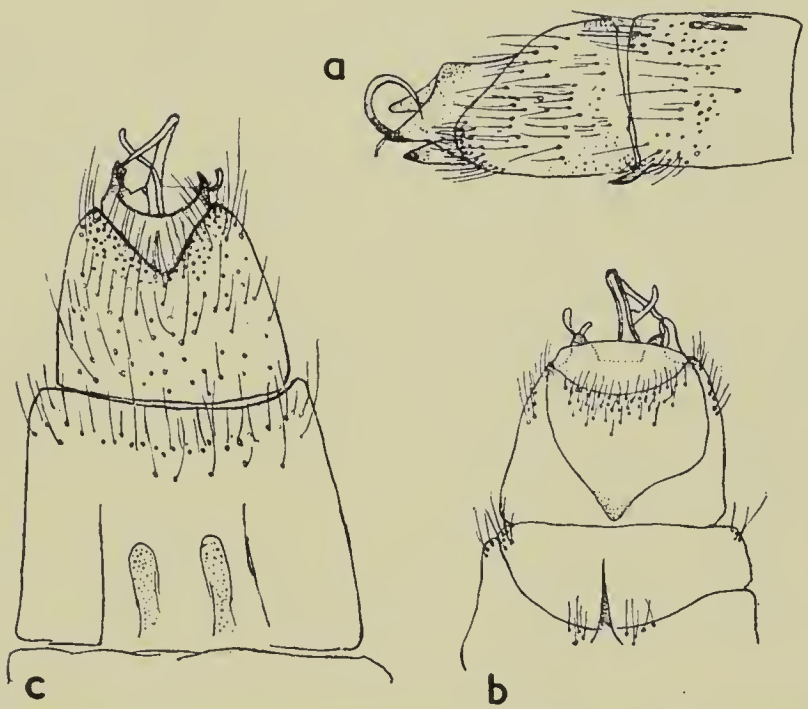

Fig. 346.—*Oxyethira albiceps* (McLachlan). ♂ genitalia (after Mosely). *a*, lateral ; *b*, dorsal ; *c*, ventral.

Eaton, in 1873, stated that the extreme apex of the anterior wings is dark and that the abdomen of the *type* is wanting.

Hudson's account of the biology of this species is as follows :

" The larva of this species, although, of course, very small in size, is extremely interesting. On examination with the microscope the case will first arrest attention, being of unique structure. Its shape is best described as closely resembling that of a minute flask, very much flattened at the lower end, with sloping shoulders and almost transparent ; its surface is slightly corrugated, and the neck of the flask composed of much denser material than the rest. It is open at both ends, the posterior end being perforated by a long, shallow slit, which extends for nearly the whole width of the case, thus admitting a free circulation of water around the enclosed insect. The larva is also able to turn round and project its head and anterior segments

through the lower aperture of the case, when it occupies the reverse position to that shown in the figure. It is, however, prevented from actually leaving the case by its abdomen, which is too large to be withdrawn from either end."

"The larva has the head and thorax horny, and pale brown in colour: the two anterior legs are rather short, and apparently prehensible in function; the other two pairs are very long and slender, and employed exclusively in walking. The abdomen is large, soft, dark green in colour, with the segments very deeply excised. At the extremity of the body there are two large breathing orifices, surrounded by a number of long bristles. Two convoluted tracheae are plainly visible extending upwards from these organs, and ramifying through the body of the insect in all directions."

"This larva is very active, pulling its comparatively large and heavy case through the green slime weed, amongst which it always lives, and no doubt feeds upon. When alarmed, the insect can entirely retreat into its case, which is very roomy, and enables the occupant not only to turn round and project its head and anterior segments through the lower aperture but also to move about quite freely, whilst entirely within the case."

"The methods, followed by the larva in the construction and subsequent enlargement of its case, are not known at present; but there is no doubt that the case is made of a viscous fluid, which hardens when exposed to the water. This material is secreted by the larva, and is analogous to silk.

"When about to change into a pupa the insect fixes its case down by four ligaments, two at each end, the extremities of these being firmly fastened to a stone: the small aperture is then closed, and after this the larva constructs an arch-shaped partition of dense material inside the case, a short distance from its broad end. In about a week the insect is transformed into a pupa, having the limbs free from the body, but incapable of motion. The fixing down of the case prior to the change is easily performed by the larva through each of the apertures, which are, for that purpose, left open until the last. When mature, the pupa breaks through the partition at the broad end of the case, and wriggles to the surface, the imago ascending a blade of grass to dry and expand its wings. The little skins of the pupae may often be noticed floating on the water, and the empty cases are very conspicuous on the sides of a glass aquarium, where the insects generally fix them down when in captivity. These fixed cases may often be found in thousands attached to the stones in the streams. They are usually commonest in the late summer, when the rivers are generally very low, and in consequence a luxuriant growth of the green slime weed is present."

"This caddis-fly must be tolerably common during the summer, but owing to its small size would not be likely to attract attention. I have seldom observed it in a state of nature, my specimens having been reared from the larva."

Paroxyethira Mosely.

Paroxyethira Mosely, 1924, *Trans. N. Zeal. Inst.*, 55 : 670.

[*Spurs* 0, 3, 4. *Ocelli* present. *Head* furnished posteriorly with two large lobes or caps. *Antennae* in the ♂ with 32 to 41 joints, according to species. *Maxillary palpi* with first and second joints short, third to fifth long, fourth rather longer than the third, fifth longer than the fourth. *Wings* long and slender; apices very acuminate, and generally furnished with tufts of white

and also black hair. In both the *anterior* and *posterior* wings forks nos. 1 and 2 are present.

Abdomen of the ♂ having the ninth segment dorsally with a wide, deep, U-shaped excision extending nearly to the base of the segment, exposing the penis in the cavity thus formed and, in one species, a complicated arrangement of asymmetric, strongly chitinized teeth. Inferior appendages with the apices directed towards each other and generally concave. From the base of the eighth sternite arises a process either broad and short or long and slender according to species and thickly covered with hair. Seventh sternite also armed with a tooth. Abdomen of the ♀ presenting no very definite characters.

Type species.—*Paroxyethira hendersoni* Mosely, 1924.

In the course of discussion on this work, Mr. Mosely expressed to me his dissatisfaction with his original figures and descriptions of this genus and its species. He did not, however, live to make the alterations himself, and I have therefore where possible made new figures from his type or paratype slides, and when necessary modified his descriptions. It will of course be understood that as only microscope slide material is available, the various aspects have necessarily been made from different examples.—D. E. K.]

Key to Species of *Paroxyethira*, Males.

1. Inferior appendages elongate ; process to eighth sternite long and spatulate . 2.
–. Inferior appendages short, quadrate ; process to eighth sternite short and broad *P. tillyardi* Mosely (p. 518).
2. Inferior appendages from side tapering to apex, which is incurved and acute *P. eatoni* Mosely (p. 518).
–. Inferior appendages from side parallel-sided ; apex rounded, incurved and set with strong teeth . . . . . *P. hendersoni* Mosely (p. 515).

Paroxyethira hendersoni Mosely (fig. 347).

Paroxyethira hendersoni Mosely, 1924, *Trans. N. Zeal. Inst.*, **55** : 673, figs. 6–9.

[*Antennae* about 41-jointed in the ♂. *Genitalia*, ♂.—Ninth segment deeply excised from above. Penis long and slender, with a small hook shortly before the apex, directed across the stem of the penis. Penis-sheaths asymmetric, two in number, arising from a sleeve-like base encircling the penis. One spine, the upper, is slender, sinuous and acute ; the other stouter and bent down, forming a trough beneath the penis, with a bifid apex. Inferior appendages long, broad and concave internally ; lower and apical margins serrate. On the upper basal margin of each can be seen (in a balsam preparation) a slender curved hook, directed upward and inward, and a short, blunt hairy process. Process of the eighth sternite very long and spatulate, with a bluntly rounded apex ; process of the seventh sternite moderately long and slender.

In the ♀ the abdomen is stout, and at the base of the eighth sternite are two strongly chitinized plates, bent over and directed towards each other.—D. E. K.]

Length of anterior wing, ♂, 3 mm.

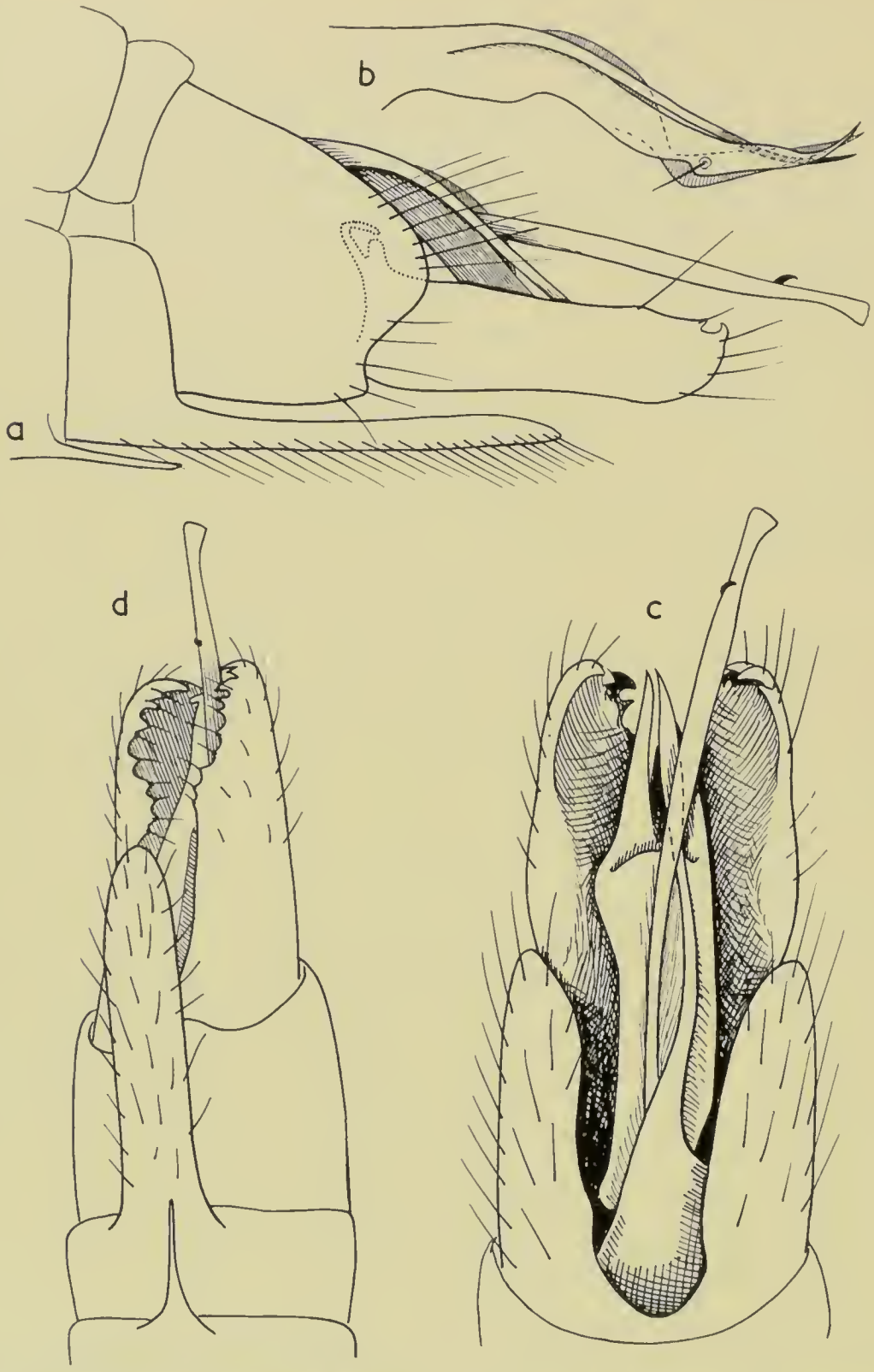

FIG. 347.—*Paroxythira hendersoni* Mosely. ♂. *a*, genitalia, lateral; *b*, penis-sheaths, lateral; *c*, genitalia, dorsal; *d*, ventral.

New Zealand: South Island, Mackenzie County, R. Te-ka-po, 24.i–3.ii.1922; Spreydon, x.1919; Arthur's Pass, 16.i.1920.

Type, ♂, in the British Museum (N.H.); paratypes, ♂♀, in the British Museum (N.H.) and Cawthron Institute.

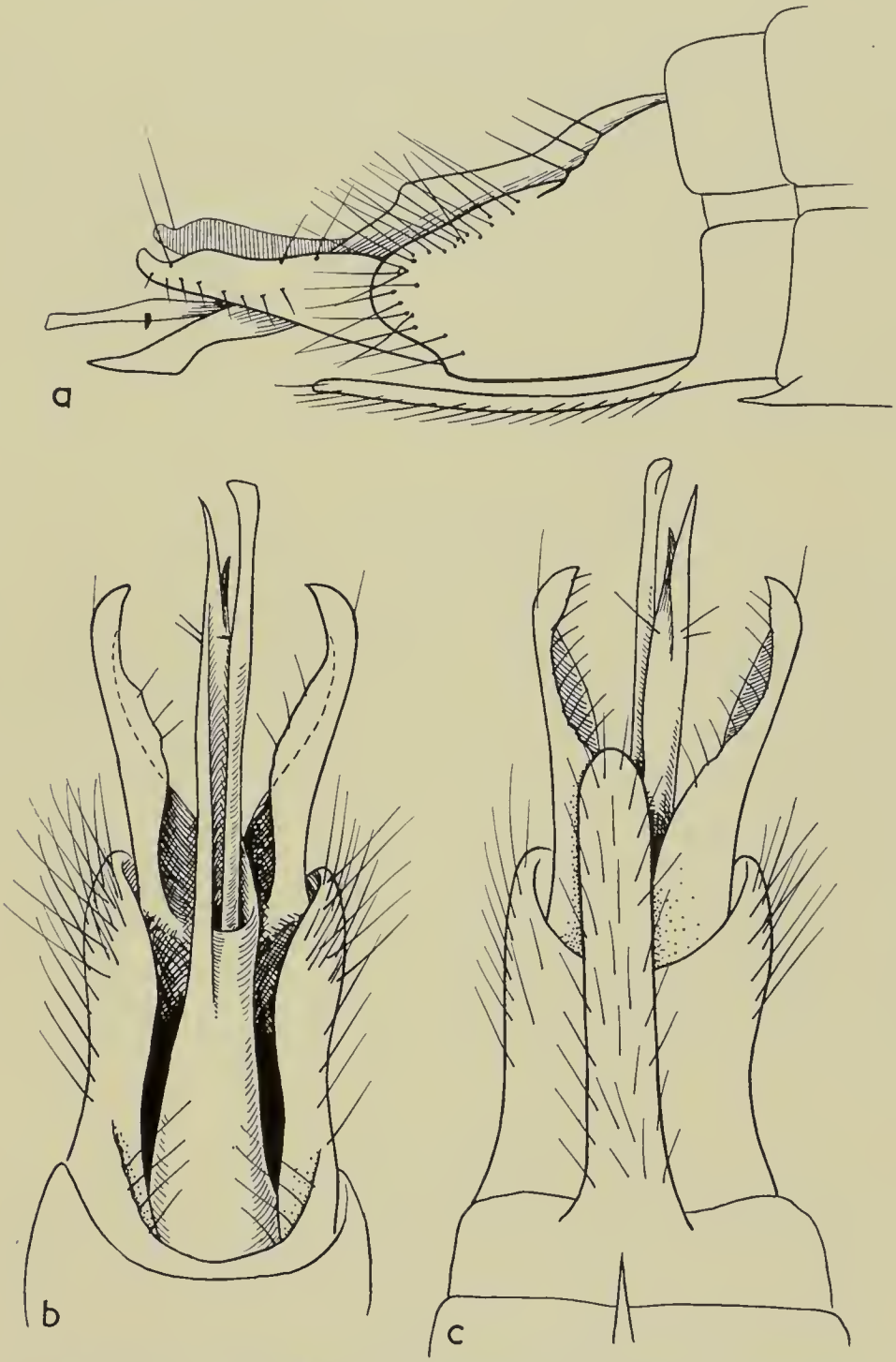

Fig. 348.—*Paroxyethira eatoni* Mosely. ♂ genitalia. *a*, lateral; *b*, dorsal; *c*, ventral.

Paroxyethira eatoni Mosely (fig. 348).

Paroxyethira eatoni Mosely, 1924, *Trans. N. Zeal. Inst.*, 55 : 673, figs. 10–12.

[*Antennae* about 33-jointed in the ♂. *Genitalia*, ♂.—Ninth segment deeply excised from above. Penis long and slender, with a small hook shortly before the apex, directed laterally across the penis. Penis-sheath with its base forming a sleeve around the penis, its lower margin produced in a long spine extending almost to the apex of the penis, its apex acute and with an acute spur shortly before the apex. Inferior appendages elongate, moderately slender, from the side with the apex slightly hooked upward. From above and below the apices are incurved and acute. Upper margins gradually dilated inwards about midway, lower margins dilated inwards at the base. Process of the eighth sternite as in *P. hendersoni*. Tooth of the seventh sternite short.—D. E. K.]

Length of anterior wing, ♂, 3 mm.

New Zealand : South Island, Mackenzie County, R. Te-ka-po, 24.i–3.ii.1922.

Type, ♂, and paratypes, ♂, in the British Museum (N.H.).

Paroxyethira tillyardi Mosely (fig. 349).

Paroxyethira tillyardi Mosely, 1924, *Trans. N. Zeal. Inst.*, 55 : 670, figs. 2–5.

[*Antennae* about 36-jointed in the ♂. *Genitalia*, ♂.—Ninth segment deeply excised from above. Within the cavity may be seen, in a balsam preparation, a series of strongly chitinized hooks, with blackened apices directed towards the left. Penis generally much exserted and bearing a strong, blackened tooth towards the apex. Inferior appendages very short, armed at their extremities each with a short, blunt, finger-like tooth, directed inwards. Process of the eighth sternite short and broad ; tooth of the seventh sternite long and slender.—D. E. K.]

In the ♀ the abdomen is stout, the last ventral segment deeply excised. There is a short tooth on the penultimate segment.

Length of anterior wing, ♂, 3·5 mm.

New Zealand : North Island, Tarawera, 12.xi.1919.

Type ♂ in the collection of the Cawthron Institute, Nelson, New Zealand ; paratypes ♂ and ♀ in the collection of the British Museum (N.H.).

Xuthotrichia Mosely.

Xuthotrichia Mosely, 1934, *Trans. R. Ent. Soc. Lond.*, 82 : 139–140.

Apices of the *wings* acute but not produced. Forks nos. 1 and 2 in *anterior wing*, no apical forks in *posterior wing*. *Ocelli* present. *Antennae* long, about 41-jointed in the male, very pale in colour in all four species. Basal joint short and rounded, only slightly longer than each of the others. *Spurs* 0, 3, 4. A long, slender ventral process to the seventh sternite.

Type species.—*Xuthotrichia ochracea* Mosely, 1934.

The genus was erected to take a group of four Australian species bearing a close resemblance to one another in the shape, neuration and coloration of the wings.

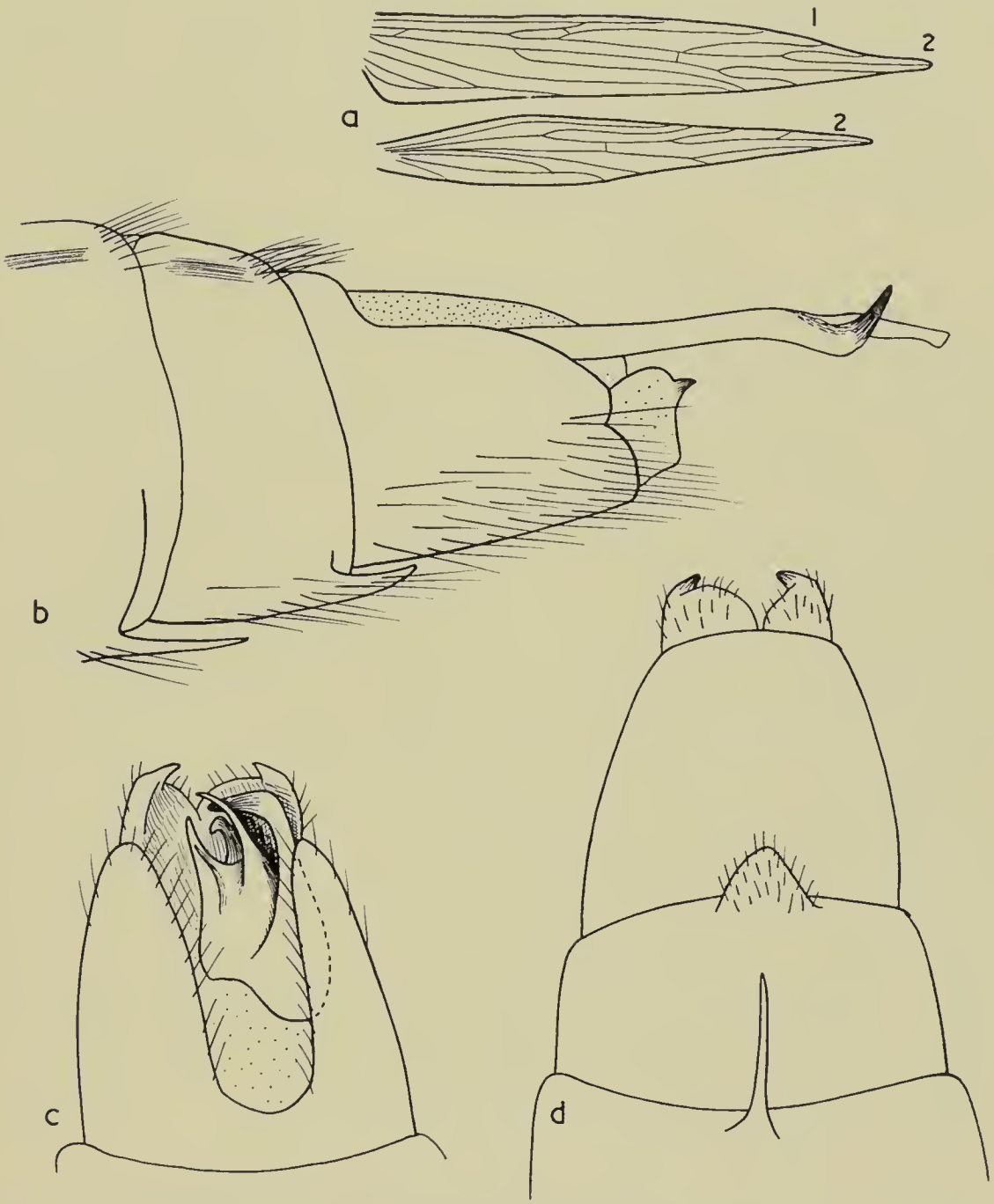

FIG. 349.—*Paroxyethira tillyardi* Mosely. ♂. *a*, wings; *b*, genitalia, lateral (after Mosely); *c*, dorsal, penis omitted; *d*, ventral, penis omitted.

KEY TO SPECIES OF *Xuthotrichia*, MALES.

1. Ninth segment from side large, obliquely truncate, almost completely obscuring the remainder of the genitalia ; no apparent inferior appendages *X. ochracea* Mosely (p. 520).
–. Ninth segment smaller, not obscuring most of the genitalia ; inferior appendages present . . . . . 2.
2. Dorsal plate rounded at apex, without socketed teeth or spines on lateral margins. Inferior appendages simple, unbranched *X. simplex* Mosely (p. 521).
–. Dorsal plate excised at its apex, lateral margins with socketed teeth or spines. Inferior appendages branched . . . . . 3.
3. Lateral margins of dorsal plate fringed from base to apex with long stout spines *X. fimbriata* Mosely (p. 523).
–. Lateral margins of dorsal plate towards apex with about four socketed teeth on each side . . . . . *X. eskensis* Mosely (p. 526).

Xuthotrichia ochracea Mosely (fig. 350).

Xuthotrichia ochracea Mosely, 1934, *Trans. R. Ent. Soc. Lond.*, 82 : 140–141.

Head covered with fuscous and very pale hairs giving a general appearance of light bronze. *Antennae* pale cream with a section towards the apex darker, tips cream ; about 40-jointed in the ♂. *Thorax* streaked with two pairs of vertical, silver bars on a fuscous ground, diverging towards the posterior margin. *Anterior wing* yellowish fuscous with a large, rounded, white patch at the centre towards the apex. Fringe along the costal margin dark fuscous nearly to the apex, when the colour is interrupted by a short length of bright gold ; apical fringe fuscous ; fringe along the posterior margin long and cream-coloured. *Posterior wing* cream-coloured with darker fringe.

Genitalia, ♂.—The terminal segment forms a strongly chitinized capsule with slightly concave upper surface. The terminal dorsal margin is widely excised, and at the base of the excision arise two pointed processes widely separated from each other. The lateral margins are produced in wide, concave processes with rounded apices. From the side, the capsule is broad at the base with the upper margin sloping slightly downward to a rounded apex ; lower margin sinuous, nearly horizontal. From beneath, the segment is deeply excised, the excision narrowing at the base to a deep cleft. From the inner surface of each lateral process towards the base there arises a bifurcate process ; outer apical angle produced in a long, very slender, posteriorly directed finger, inner angle of the process with the apex bent downward and inward. There is a single spine midway on the inner margin of each process directed horizontally inwards. From the side, only the process of the outer apical angle can be seen, and it appears as a broad, down-curving sickle-blade. Penis with a broad hook at the apex directed at right angles towards the right. Ventral process of the seventh sternite long and slender, from the side slightly sinuous.

Length of the anterior wing, ♂, 3 mm.

AUSTRALIA : Queensland, Brisbane, 30.ix.1920, R. J. Tillyard.

Type, ♂, mounted as microscope preparations, now in the British Museum (N.H.).

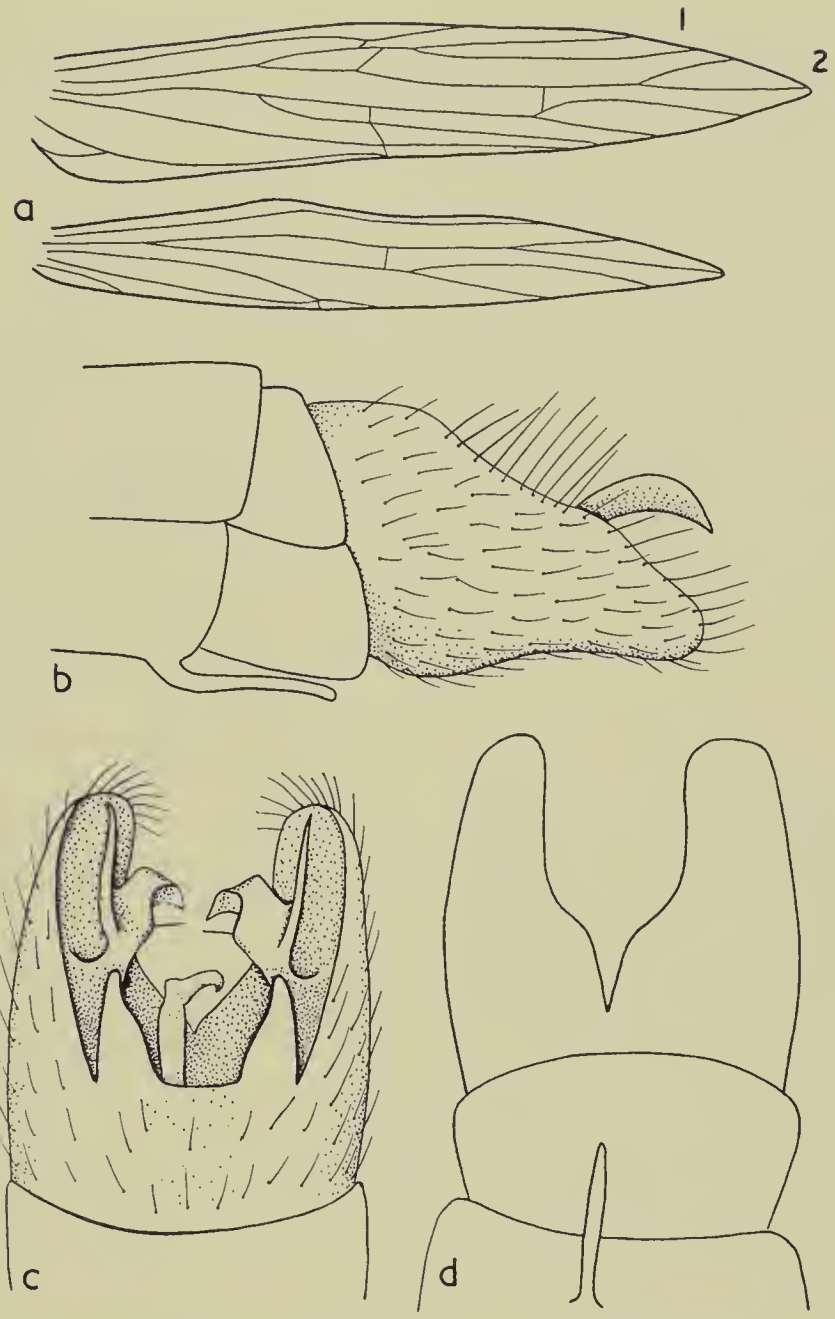

Fig. 350.—*Xuthotrichia ochracea* Mosely. ♂. *a*, wings ; *b*, genitalia, lateral ; *c*, dorsal ; *d*, inferior appendages, ventral.

Xuthotrichia simplex Mosely (fig. 351).

Xuthotrichia simplex Mosely, 1934, *Trans. R. Ent. Soc. Lond.*, **82** : 145.

Head tawny with light, tawny hairs (possibly faded). *Antennae* pale cream-coloured. *Palpi* and *legs* ochraceous. *Anterior wing* tawny with scattered groups of dark, upright hairs. Costal fringe dark near the base of

the wing, then there is a light patch nearly to the apex, followed by a short stretch of light gold just before the apex, where the fringe is much darker. There is a gold spot at the extreme apex of the wing, with a dark one imme-

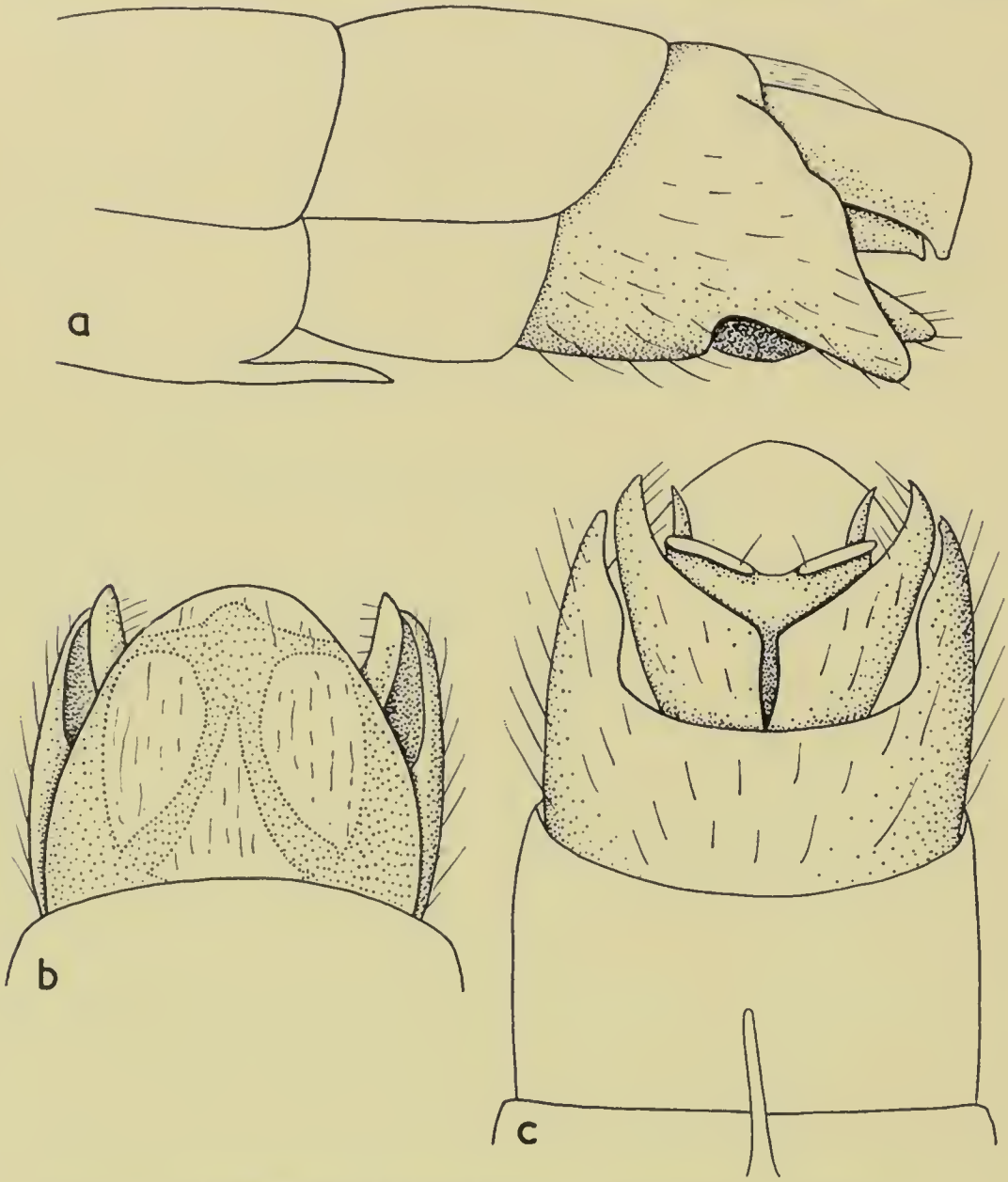

FIG. 351.—*Xuthotrichia simplex* Mosely. ♂ genitalia. *a*, lateral; *b*, dorsal; *c*, ventral.

diately behind it and another gold spot behind this, somewhat towards the posterior apical margin. *Posterior wing* fulvous with the apex darker.

Genitalia, ♂.—Ninth segment much protruded in the single example (which may be teneral), only lightly chitinized. From the side, the segment is broad at the base, much produced at the apex to form a broad, downwardly

pointing finger ; there is an angular excision along the lower margin. From above, there is a rounded, membranous dorsal plate strengthened by rather broad, chitinous strips, the bases of which are widely separated ; they then approach each other and are united towards the apical margin in a rounded patch from which two, short, horizontal bars extend to the outer margin. From the side the apex of the plate is turned downwards and the appearance is that of a nearly rectangular process. Beneath is a pair of narrow, posteriorly directed and widely separated plates, which, in the side view, are seen to terminate in acute, downwardly directed apices. Penis much retracted, with an undilated apex directed towards the left. Beneath the penis, seen from beneath, is a lower penis-cover in the form of two horizontal plates with the apices somewhat rolled over, joined at the centre by a membrane. Inferior appendages from beneath widely divergent, terminating in acute apices. Margin of the ninth ventral segment deeply and widely excised. Process of the seventh sternite long and slender.

Length of the anterior wing, ♂, 3 mm.

AUSTRALIA : Queensland, Warwick, October.

Type, ♂, with abdomen mounted in balsam, now in the British Museum N.H.).

Xuthotrichia fimbriata Mosely (fig. 352).

Xuthotrichia fimbriata Mosely, 1934, *Trans. R. Ent. Soc. Lond.*, 82 : 142–145.

Head dark fuscous with a few cream-coloured hairs. *Antennae* cream-coloured. *Palpi* and *legs* ochraceous. *Anterior wing* pale fuscous. Fringe near the base of the costal margin dark, then rather paler with a dark patch followed by a nearly white patch towards the apex, which is black, as is also the apex of the *posterior wing*. Other markings indistinct. One anterior wing missing in the type.

Genitalia, ♂.—From above, ninth segment much protruded, appearing as a somewhat square, strongly chitinized, shining plate, slightly concave towards the centre of the upper surface. From the side, the apical margin is much extended posteriorly, narrowing slightly to the rounded apex. There is a large dorsal plate, wide at the base, narrowing to a deeply excised apex. Lateral margins with fringes of long, stout spines attached to the more strongly chitinized edgings. The penis, which can be seen in the cleft of the dorsal plate and also from beneath, terminates in a wide, falcate apex, with a semi-circular excision in the apical margin situated to one side and rendering the apex asymmetric. Beneath the penis is a membranous lower penis-cover which is hood-shaped, outer edges turned slightly under ; at the outer sides of this cover are two long, slender spines, with their bases widely divergent, approaching each other slightly towards their centres, apices directed tail-wards. Inferior appendages three-branched. From the side, the lowest branch is stout with the upper margin strongly serrate ; from beneath it is short and conical. The second branch is strong, hooked as seen from beneath, apex curling inwards and downwards. From the side, the apex is dilated in

a broad, downwardly directed hook. The upper or third branches, from beneath, are short, slender and widely divergent, arising from a common broad base with a slight triangular projection between them, apices each armed with a bristle. These third branches, from beneath, appear almost

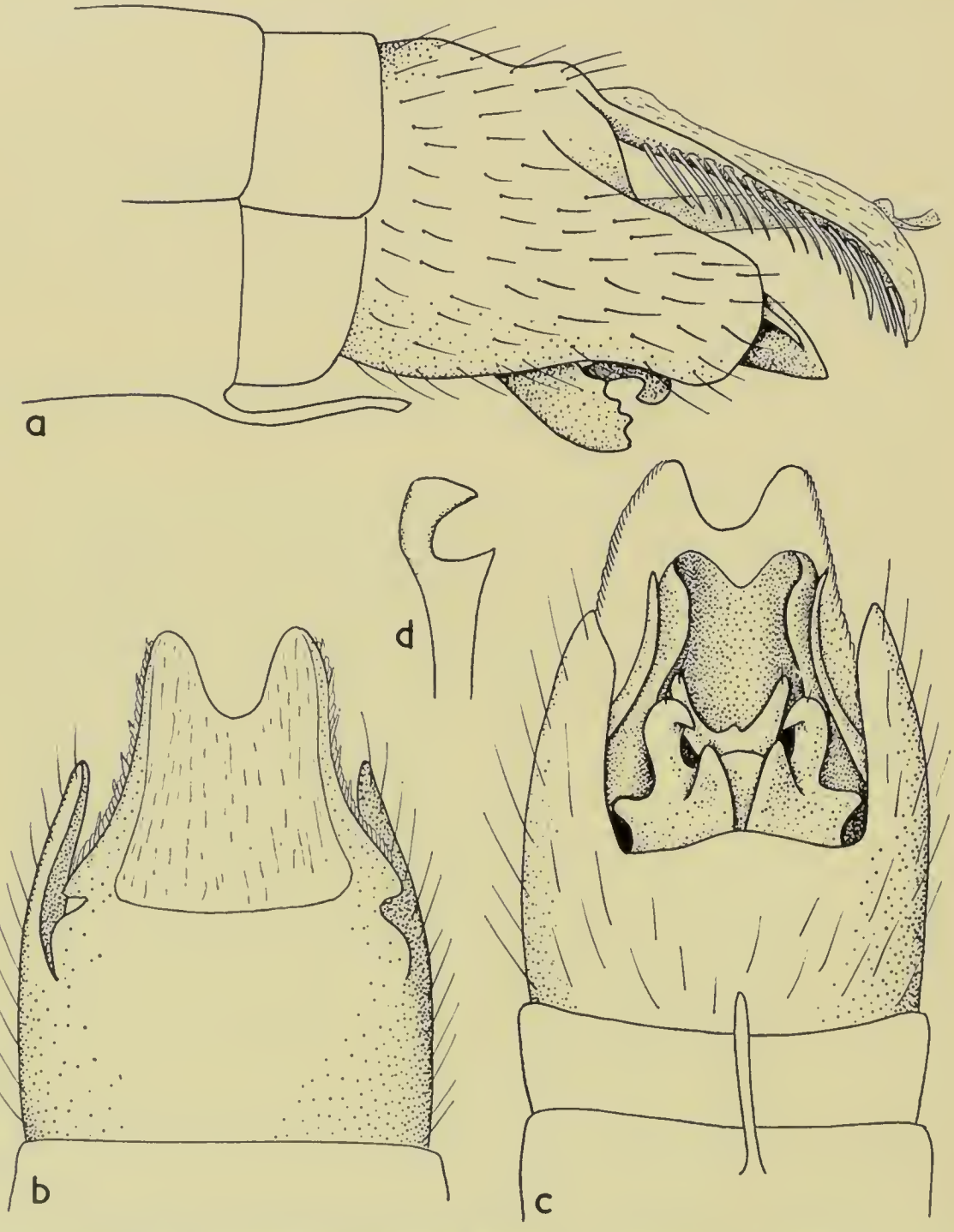

Fig. 352.—*Xuthotrichia fimbriata* Mosely. ♂ genitalia. *a*, lateral; *b*, dorsal; *c*, ventral.

as a separate process. The outer margins of the appendages, from beneath, are produced towards their bases in angular projections. Margin of the ninth ventral segment very deeply excised, the base of the excision wide and slightly

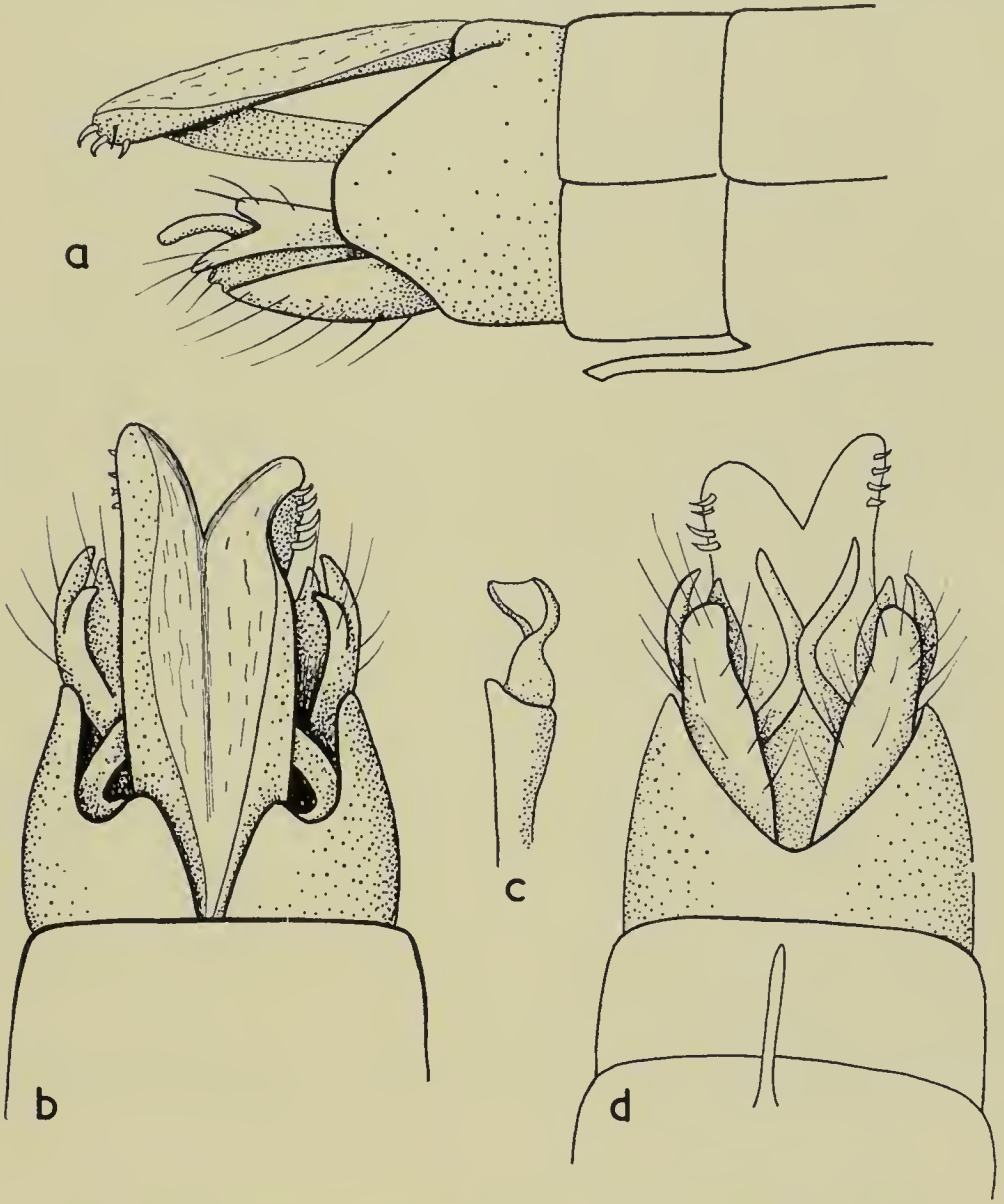

Fig. 353.—*Xuthotrichia eskensis* Mosely. ♂ genitalia. *a*, lateral; *b*, dorsal; *c*, ventral.

produced at the centre. Ventral process of the seventh sternite long, slender and slightly sinuous from the side.

Length of the anterior wing, ♂, 2·5 mm.

Australia: New South Wales: Heathcote, 26.viii.1916, R. J. Tillyard.

Type, ♂, with abdomen mounted in balsam, now in the British Museum (N.H.).

Xuthotrichia eskensis Mosely (fig. 353).

Xuthotrichia eskensis Mosely, 1934, *Trans. R. Ent. Soc. Lond.*, 82 : 141.

Head covered with cream-coloured hairs. *Antennae* 41-jointed, very light fuscous. *Palpi* light fuscous. *Anterior wing* yellowish with several dark fuscous blotches : four along the costal margin extending into the fringe, the fourth, at the extreme apex, spreading slightly round to the lower margin. There are also two pairs of short, linear, brown marks, one pair towards the base of the wing with the lower line rather nearer to the apex than the upper, and the second pair towards the apex with the lower line again nearer to the apex and almost based on the lower margin. *Posterior wing* pearly grey with pearly grey fringes. *Legs* light fuscous, posterior pair heavily fringed with pearly grey hairs.

Genitalia, ♂.—From above, the apical margin of the last dorsal segment very deeply excised. In the excision is seen a large, bifurcate, asymmetric plate, the left fork being larger than the right ; attached to the plate are chitinous strengthening ribs supporting the outer edges and the centre. At each apical lateral margin and slightly beneath it is a group of strong claws. The edge of the plate on the right side is slightly twisted, perhaps aberrantly, so that the claws can be seen from above ; those on the left are concealed by the plate. Penis very long and slender ; apex dilated but not clearly visible. There are two strongly chitinized, dark and slender spines, only the bases visible from above, and the apices, which curve slightly downward, from the side. From beneath, the bases are widely separated ; they approach each other and slightly overlap at the centre and diverge at their apices. Inferior appendages rather broad, each dividing into four branches. From beneath, the lowest of these branches is long and broad with a broad, rounded apex ; the apices of two more slender branches may be seen above it. The fourth branch, which is small and incurving, can be seen only from above and the side. Ventral process of the seventh sternite long and slender, from the side slightly sinuous.

Length of the anterior wing, ♂, 3 mm.

Australia : Queensland, Esk, 9.vii.1916, R. J. Tillyard.

Type, ♂, mounted as microscope preparations, now in the British Museum (N.H.).

CHECK LIST OF THE TRICHOPTERA RECORDED FROM AUSTRALIA, TASMANIA AND NEW ZEALAND.

By D. E. Kimmins.

Family **PLECTROTARSIDAE** nov.

1. **Plectrotarsus** Kolenati
   1. *gravenhorstii* Kolenati
   2. *tasmanicus* Mosely
   3. *minor* sp. n.

Family **LIMNEPHILIDAE** Kolenati.

2. **Archaeophylax** gen. n. (Kimmins)
   4. *ochreus* sp. n.

Family **SERICOSTOMATIDAE** McLachlan.

3. **Coenoria** gen. n.
   5. *boera* sp. n.
4. **Pycnocentria** McLachlan
   6. *funerea* McLachlan
   7. *evecta* McLachlan
   8. *forcipata* sp. n.
5. **Matasia** Mosely
   9. *satana* Mosely
6. **Hampa** gen. n.
   10. *patona* sp. n.
7. **Costora** Mosely
   11. *iena* Mosely
   12. *delora* sp. n.
   13. *rotosca* sp. n.
8. **Beraeoptera** gen. n.
   14. *roria* sp. n.
9. **Antipodoecia** Mosely
   15. *turneri* Mosely
10. **Tamasia** Mosely
    16. *variegata* Mosely
11. **Caenota** gen. n.
    17. *plicata* sp. n.
    18. *simulans* sp. n.
12. **Tismana** gen. n.
    19. *saneva* sp. n.
13. **Helicopsyche** Hagen
    20. *heacota* sp. n.
    21. *bartona* sp. n.
    22. *tillyardi* sp. n.
    23. *murrumba* sp. n.
    24. *iltona* sp. n.
    25. *albescens* Tillyard
    26. *howesi* Tillyard
    27. *zealandica* Hudson
14. **Saetotricha** Brauer
    28. *ptychopteryx* Brauer
15. **Pycnocentrodes** Tillyard
    29. *aureola* (McLachlan)
    30. *chiltoni* Tillyard
    31. *hamiltoni* Tillyard
    32. *olingoides* Tillyard
16. **Conoesucus** Mosely
    33. *fromus* Mosely
    34. *norelus* sp. n.
    35. *semiauratus* sp. n.
17. **Lingora** Mosely
    36. *aurata* Mosely
    37. *coomata* sp. n.
    38. *plicata* Banks
18. **Oeconesus** McLachlan
    39. *maori* McLachlan
    40. *zelandensis* sp. n.
    41. *similis* sp. n.
    42. *incisus* sp. n.
19. **Pseudoeconesus** McLachlan
    43. *stramineus* McLachlan
    44. *squamosus* sp. n.
    45. *hudsoni* sp. n.
    46. *mimus* McLachlan
    47. *karoriensis* sp. n.

20. **Zelandopsyche** Tillyard
    48. *ingens* Tillyard
21. **Tasimia** Mosely
    49. *palpata* Mosely
    50. *natasia* sp. n.
    51. *serrata* sp. n. (Kimmins)
22. **Olinga** McLachlan
    52. *feredayi* (McLachlan)

Family **PHILANISIDAE** nov.

23. **Philanisus** Walker
    53. *plebeius* Walker

Family **BERAEIDAE** Wallengren.

24. **Alloecella** Banks
    54. *grisea* Banks
    55. *warneria* sp. n.
25. **Pycnocentrella** gen. n.
    56. *eruensis* sp. n.

Family **MOLANNIDAE** Wallengren.

26. **Molaniella** Banks
    57. *atra* Banks

Family **HELICOPHIDAE** nov.

27. **Helicopha** gen. n.
    58. *astia* sp. n.
    59. *hortena* sp. n.

Family **ODONTOCERIDAE** Wallengren.

28. **Caloca** gen. n.
    60. *straminea* sp. n.
    61. *tertia* sp. n.
    62. *eba* sp. n.
    63. *fallia* sp. n.
29. **Barynema** Banks
    64. *costatum* Banks
    65. *australicum* sp. n.
30. **Marilia** Fr. Müller
    66. *bola* sp. n.
    67. *fusca* sp. n. (Kimmins)
31. **Atriplectides** Mosely
    68. *dubia* Mosely

Family **CALAMOCERATIDAE** Ulmer.

32. **Anisocentropus** McLachlan
    69. *latifascia* (Walker)
    71. *bang-haasi* Ulmer
    71. *semiflavus* Banks

Family **PHILORHEITHRIDAE** Mosely.

33. **Philorheithrus** Hare
    72. *agilis* (Hudson)
    73. *lacustris* Tillyard
34. **Tasmanthrus** Mosely
    74. *angustipennis* Mosely
35. **Aphilorheithrus** Mosely
    75. *stepheni* Mosely
36. **Austrheithrus** gen. n.
    76. *dubitans* sp. n.
    77. *ronewa* sp. n.
37. **Kosrheithrus** gen. n.
    78. *tillyardi* sp. n.

Family **LEPTOCERIDAE** Leach.

38. **Triplectides** Kolenati
    79. *magna* (Walker)
    80. *cephalotes* (Walker)
    81. *gilolensis* (McLachlan)
    82. *ciuska* sp. n.
    83. *similis* sp. n.
    84. *volda* sp. n.
    85. *obsoleta* (McLachlan)
    86. *niveipennis* sp. n.
    87. *tambina* sp. n.
    88. *varius* sp. n. (Kimmins)
    89. *dubius* sp. n.
        dubius var. *subalbidus* n. (Kimmins)
    90. *albana* sp. n.
    91. *australica* Banks
    92. *australis* Navás
    93. *elongata* Banks
    94. *parva* (Banks)

39. **Triplexa** gen. n.
    95. *villa* sp. n.
40. **Triplexina** gen. n.
    96. *nigra* sp. n.
41. **Triplectidina** Mosely
    97. *nigricornis* Mosely
    98. *oreolimnetes* (Tillyard)
42. **Hudsonema** Mosely
    99. *aliena* (McLachlan)
    100. *amabilis* (McLachlan)
    101. *maculata* sp. n.
    102. *sparsa* sp. n. (Kimmins)
43. **Notalina** Mosely
    103. *parkeri* Mosely
    104. *moselyi* sp. n. (Kimmins)
    105. *flava* (Ulmer)
    106. *delicatula* (Ulmer)
    107. *fulva* sp. n. (Kimmins)
    108. *tillyardi* sp. n. (Kimmins)
44. **Symphitoneuria** Ulmer
    109. *exigua* (McLachlan)
    110. *opposita* (Walker)
    111. *wheeleri* Banks
45. **Lectrides** gen. n.
    112. *varians* sp. n.
46. **Leptorussa** gen. n.
    113. *russata* sp. n.
    114. *darlingtoni* (Banks)
47. **Triaenodes** McLachlan
    115. *volda* sp. n.
48. **Leptocerus** Leach (=**Setodes** McLachlan *partim*)
    116. *assimulans* (Ulmer)
    117. *souta* sp. n.
49. **Oecetis** McLachlan
    118. *asmanista* sp. n.
    119. *minasata* sp. n.
    120. *complexa* sp. n. (Kimmins)
    121. *aeoloptera* sp. n. (Kimmins)
    122. *atarpa* sp. n.
    123. *arcada* sp. n.
    124. *parka* sp. n.
    125. *multipunctata* Ulmer
    126. *inscripta* sp. n. (Kimmins)
    127. *laustra* sp. n.
    128. *unicolor* (McLachlan)
    129. *pechana* sp. n.
    130. *lurida* sp. n. (Kimmins)
    131. *australis* (Banks)

Family **HYDROPSYCHIDAE** Curtis.

50. **Macronemum** Pictet
    132. *dubium* (Ulmer)
    133. *australe* (McLachlan)
    134. *banksi* nom. nov.
    135. *pulchripenne* (Tillyard)
    136. sp. ♀
51. **Hydropsyche** Pictet
    137. *fimbriata* McLachlan
    138. *colonica* McLachlan
    139. *tepoka* sp. n.
    140. *auricoma* Hare
    141. *occulta* (Hare)
52. **Cheumatopsyche** Wallengren
    142. *modica* (McLachlan)
    143. *philpotti* (Tillyard)
53. **Smicridea** McLachlan
    144. *australis* Ulmer
    145. *parvula* sp. n.
    146. *parva* Banks
    147. *ulmeri* Banks
54. **Asmicridea** gen. n.
    148. *edwardsi* (McLachlan)
    149. *grisea* (Mosely)
55. **Diplectrona** Westwood
    * 150. *angustata* Banks
    151. *zealandensis* sp. n.
    152. *satana* sp. n.
    153. *castanea* sp. n. (Kimmins)
    154. *bifurcata* sp. n. (Kimmins)
    155. *bourina* sp. n.
    156. *cognata* sp. n. (Kimmins)
    157. sp. ♀
56. **Sciops** McLachlan
    158. *inermis* Banks
    159. *spinata* Banks

* 150a. *rossi* sp. n. (Kimmins).

57. **Austropsyche** Banks
    160. *victoriana* Banks

Family **POLYCENTROPODIDAE** Ulmer.

58. **Plectrocnemia** Stephens
    161. *australica* Banks
    162. *maclachlani* sp. n.

59. **Nyctiophylax** Brauer
    163. *parvus* sp. n.
    164. sp. ♀

60. **Polyplectropus** Ulmer
    165. *puerilis* (McLachlan)
    166. *lacus-albinae* sp. n. (Kimmins)

61. **Stenopsychodes** Ulmer
    167. *hiemalis* Tillyard
    168. *melanochrysa* Tillyard
    169. *mjöbergi* Ulmer
    170. *tillyardi* Banks
    171. *montana* Tillyard
    172. *venusta* sp. n. (Kimmins)

Family **PSYCHOMYIDAE** Kolenati.

62. **Ecnomus** McLachlan
    173. *tillyardi* sp. n.
    174. *continentalis* Ulmer

63. **Ecnomina** gen. n. (Kimmins)
    175. *spinosa* sp. n. (Kimmins)
    176. *trifurcata* sp. n. (Kimmins)
    177. *irrorata* sp. n. (Kimmins)

Family **PHILOPOTAMIDAE** Wallengren.

64. **Hydrobiosella** Tillyard
    178. *stenocera* Tillyard
    179. *tasmanica* sp. n.
    180. *cognata* sp. n. (Kimmins)
    181. *michaelseni* (Ulmer)
    182. *waddama* sp. n.
    183. *bispina* sp. n. (Kimmins)
    184. *arcuata* sp. n. (Kimmins)

65. **Zelobiosella** gen. n.
    185. *tonela* sp. n.

66. **Chimarra** Stephens
    186. *uranka* sp. n.
    187. *australica* (Ulmer)
    188. *monticola* sp. n. (Kimmins)
    189. *australis* (Navás)

Family **RHYACOPHILIDAE** Stephens.

67. **Hydrobiosis** McLachlan
    190. *styx* McFarlane
    191. *spatulata* McFarlane
    192. *gollanis* sp. n.
    193. *umbripennis* McLachlan
    194. *parumbripennis* McFarlane
    195. *silvicola* McFarlane
    196. *kiddi* McFarlane
    197. *harpidiosa* McFarlane
    198. *frater* McLachlan
    199. *soror* sp. n.
    200. *clavigera* McFarlane
    201. *charadraea* McFarlane
    202. *ingenua* Hare.

68. **Psilochorema** McLachlan
    203. *mimicum* McLachlan
    204. *nemorale* McFarlane
    205. *macroharpax* McFarlane
    206. *bidens* McFarlane
    207. *leptoharpax* McFarlane

69. **Ulmerochorema** gen. n. (Kimmins)
    208. *stigma* (Ulmer)

70. **Taschorema** Mosely
    209. *asmana* Mosely
    210. *nigra* sp. n.
    211. *brunnea* sp. n.
    212. *evansi* sp. n.
    213. *ochracea* sp. n.

71. **Notiobiosis** Banks
    214. *pallescens* Banks
    215. *nigrita* Banks
    216. *cassicola* (McFarlane)
    217. *maxima* (McFarlane)
    218. *fusca* (McFarlane)
    219. *shandi* (McFarlane)
    220. *banksiensis* (McFarlane)
    221. *borealis* (McFarlane)

72. **Anachorema** gen. n.
    222. *tasmanica* sp. n.
    223. *brevis* sp. n.
    224. *seona* sp. n.
    225. *evansi* sp. n.

73. **Synchorema** Tillyard
    226. *zelandica* sp. n.
    227. *zygoneura* Tillyard

74. **Neurochorema** Tillyard
    228. *confusum* (McLachlan)
    229. *armstrongi* McFarlane

75. **Hydrochorema** Tillyard
    230. *crassicaudatum* Tillyard
    231. *tenuicaudatum* Tillyard

76. **Costachorema** McFarlane
    232. *callistum* McFarlane
    233. *brachyptera* McFarlane
    234. *xanthoptera* McFarlane
    235. *psaroptera* McFarlane

77. **Austrochorema** gen. n.
    236. *wenta* sp. n.

78. **Allobiosis** gen. n.
    237. *erratica* sp. n.

79. **Psyllobetina** Banks
    238. *plutonis* Banks

80. **Tiphobiosis** Tillyard
    239. *montana* Tillyard
    240. *fulva* Tillyard
    241. *intermedia* sp. n.

81. **Allochorema** gen. n.
    242. *tasmanica* sp. n.

82. **Bachorema** gen. n.
    243. *obliqua* sp. n.
    244. *gisba* sp. n.

83. **Agapetus** Curtis
    245. *monticolus* Banks

84. **Synapetus** McLachlan
    246. *tasmanicus* sp. n.
    247. *crala* sp. n.
    248. *pontona* sp. n.

Family **HYDROPTILIDAE** Stephens.

85. **Zelandoptila** Tillyard
    249. *moselyi* Tillyard

86. **Hydroptila** Dalman
    250. *losida* sp. n.
    251. *incertula* Mosely
    252. *tasmanica* Mosely

87. **Orphninotrichia** Mosely
    253. *maculata* Mosely

88. **Oxyethira** Eaton
    254. *albiceps* (McLachlan)

89. **Paroxyethira** Mosely
    255. *hendersoni* Mosely
    256. *eatoni* Mosely
    257. *tillyardi* Mosely

90. **Xuthotrichia** Mosely
    258. *ochracea* Mosely
    259. *simplex* Mosely
    260. *fimbriata* Mosely
    261. *eskensis* Mosely

APPENDIX

This work was completed in July, 1949, but was delayed by negotiations over the cost of publication. In March, 1951, there appeared the long-awaited second part of Mr. A. G. McFarlane's work on the New Zealand Rhyacophilidae, and also another short paper by him, adding in all fifteen new species to the New Zealand list. Four of his species forestall species which Mr. Mosely had described (in manuscript) for this work. Mosely's names have therefore been suppressed, there being no point in publishing stillborn names, and the keys in the main body of the work have been revised to include the remainder of McFarlane's new species. Insertion of McFarlane's descriptions of these species in their correct places in the text would have entailed considerable labour in re-numbering of figures and it has been decided to add his descriptions and figures as an appendix.

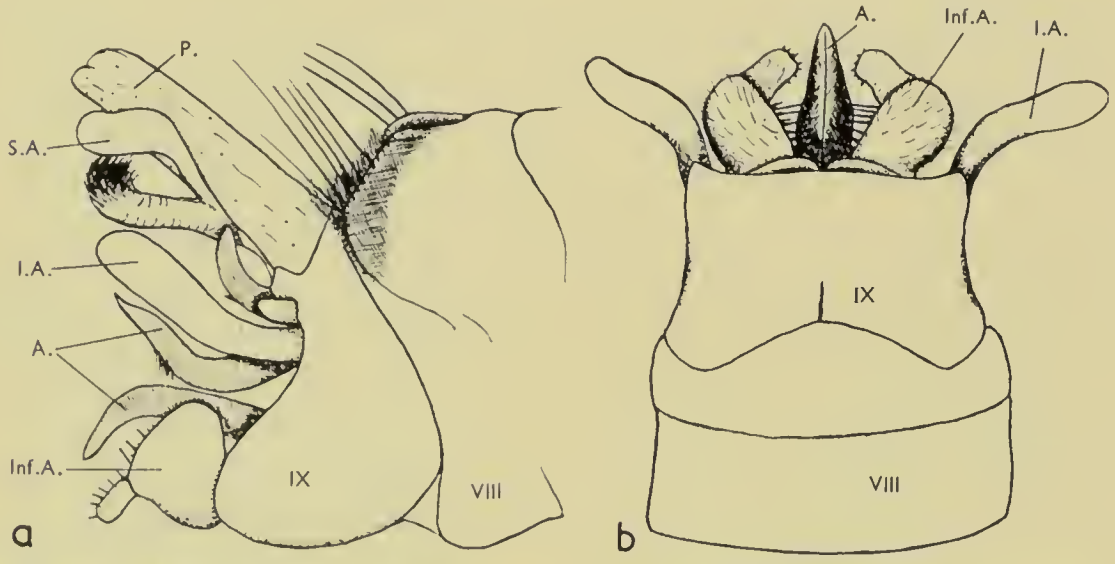

Fig. 354.—*Hydrobiosis harpidiosa* McFarlane. ♂ genitalia. *a*, lateral; *b*, ventral.

These illustrations (figs. 354–364) are from Mr. A. G. McFarlane's original drawings, and have been lent for reproduction by the courtesy of the Canterbury Museum Trust Board, to whom and to Mr. McFarlane we wish to express our grateful appreciation for their willing co-operation.

The lettering of the figures is as follows :

A, aedeagus. I.A., intermediate appendage. Inf. A., inferior appendage. P., proctiger, an unsclerotized segment (?) carrying the anus. S.A., superior appendage. S.T., sclerotized tubercles. P.M., paramere of the aedeagus. F., filum of the aedeagus. S.P., spatulate process.

D. E. Kimmins,
5 June, 1951.

Hydrobiosis harpidiosa McFarlane (fig. 354).

Hydrobiosis harpidiosa McFarlane, 1951, *Rec. Canterbury Mus.*, 5 : 257, pl. 57, figs. 7, 8.

McFarlane describes this species as follows :

" Expanse male, 20 to 21 mm. Female, 26 mm ; very uniform in size."

" A lighter coloured and less hairy insect than *H. parumbripennis* n. sp. Forewings narrow, more pointed than genotype, membrane uniformly coloured throughout ; male forewings less hairy and more acute than female ; spurs male 0 4 4, female 2 4 4, the foreleg spurs very unequal."

" Male abdomen : small tooth on antepenultimate sternite ; genitalia inconspicuous in fresh specimen ; inferior appendages irregular, broad, short, terminal part elongate ; intermediate appendages, short, thick, curved, compressed laterally, not clubbed terminally ; superior appendages bifid, the upper branch being the longer ; sclerotised area at ventral base of proctiger gives rise to two pairs of appendages, the basal pair curving dorsally to end in a tuft of spines, the second pair flattened distally ; lower projection of aedeagus, simple ; eighth tergite deeply cleft at posterior margin, a mat of short fur-like hair within the cleft, overlaid by long, coarse hair."

" Female terminal sternite smoothly rounded with little or no free margin ; well-formed tooth on antepenultimate sternite ; small, blunt tooth on penultimate sternite."

" Types in Canterbury Museum."

" Habitat : main waters of the Waimakariri from the foothills upwards."

Hydrobiosis kiddi McFarlane (fig. 355).

Hydrobiosis kiddi McFarlane, 1951, *Rec. Canterbury Mus.*, 5 : 257, pl. 57, figs. 9, 11.

" Expanse, male 20 to 21 mm.; female unknown."

" A dark insect, moderately hairy ; a few light flecks on the forewing."

" Male abdomen : long needle-like tooth on antepenultimate sternite ; ultimate tergite reduced mid-dorsally to a strong narrow band. Genitalia large ; inferior appendage from side, long, narrow, nearly straight, hairy ; from below the basal portion is seen to be broader, and less than half the total length ; intermediate appendage shorter than inferior appendage, cylindrical ; superior appendage with rectangular basal part continuing in the line of the lower side to form a horn : aedeagus large, lower projection simple, the upper projections a pair of needle-like processes, thickened towards the point ; parameres similar to the upper processes of the aedeagus."

" Holotype male and paratypes in Canterbury Museum."

" Specimens from Broken River to Arthurs Pass ; rare."

Hydrobiosis spatulata McFarlane (fig. 356).

Hydrobiosis spatulata McFarlane, 1951, *Rec. Canterbury Mus.*, 5 : 258, pl. 58, figs. 14, 15.

" Expanse : Male 21 mm."

" A fuscous insect, very hairy, with dense long fringe between apex and termen of forewings. Spurs, 2 4 4 both sexes."

" Male abdomen, long spinous tooth on antepenultimate sternite, a short, thick, rounded, hairy tooth on penultimate sternite ; a spatulate process arising from the anterior margin of the ultimate sternite : genitalia very conspicuous : inferior

appendage long, narrow, curved, the tips often crossing, very hairy: intermediate appendage slender, clubbed terminally; superior appendage short, peg-like viewed from the side: aedeagus large, a pair of styliform processes dorsally, a single lower

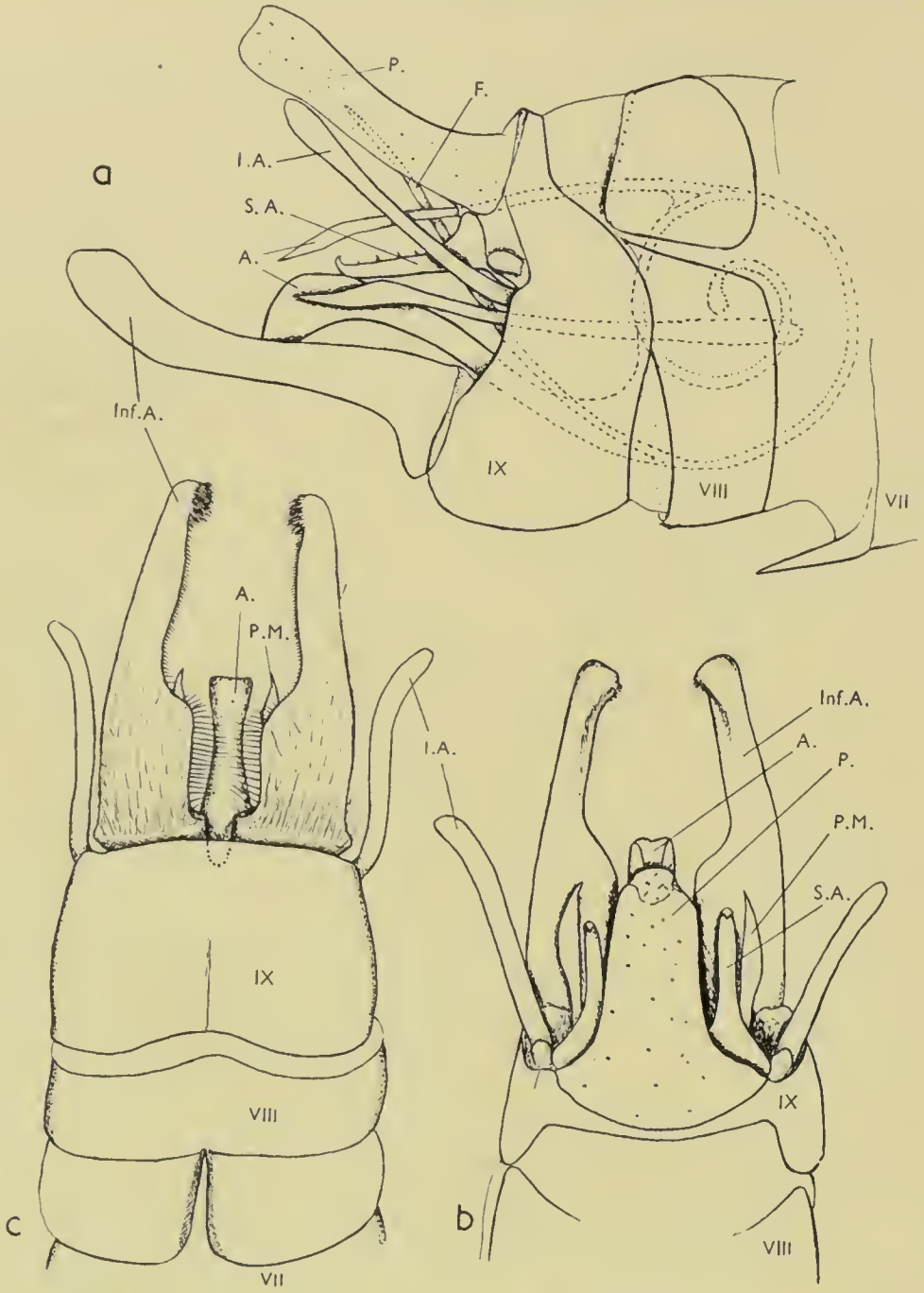

FIG. 355.—*Hydrobiosis kiddi* McFarlane. ♂ genitalia. *a*, lateral; *b*, dorsal; *c*, ventral.

spatulate process notched terminally, and a very conspicuous pair of long brown parameres curving down and inwards to cross near the tips; proctiger long and slender."

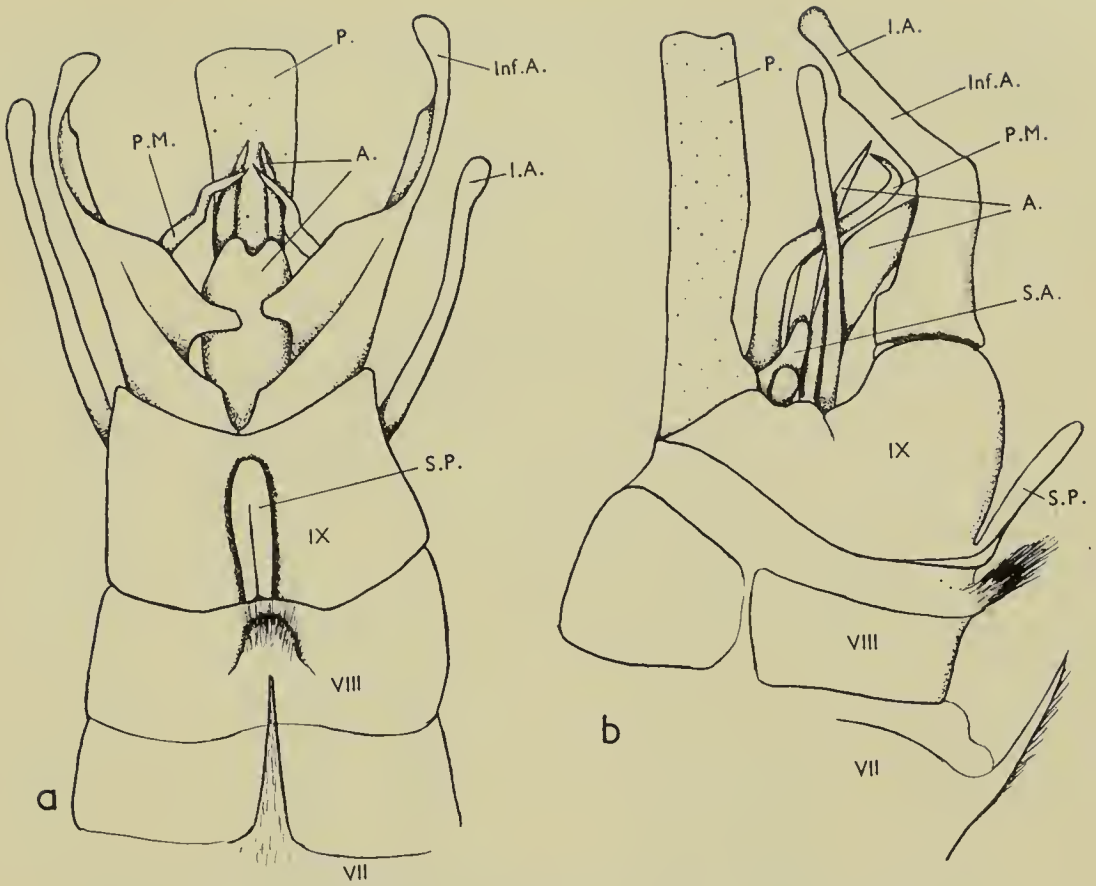

FIG. 356.—*Hydrobiosis spatulata* McFarlane. ♂ genitalia. *a*, ventral ; *b*, lateral.

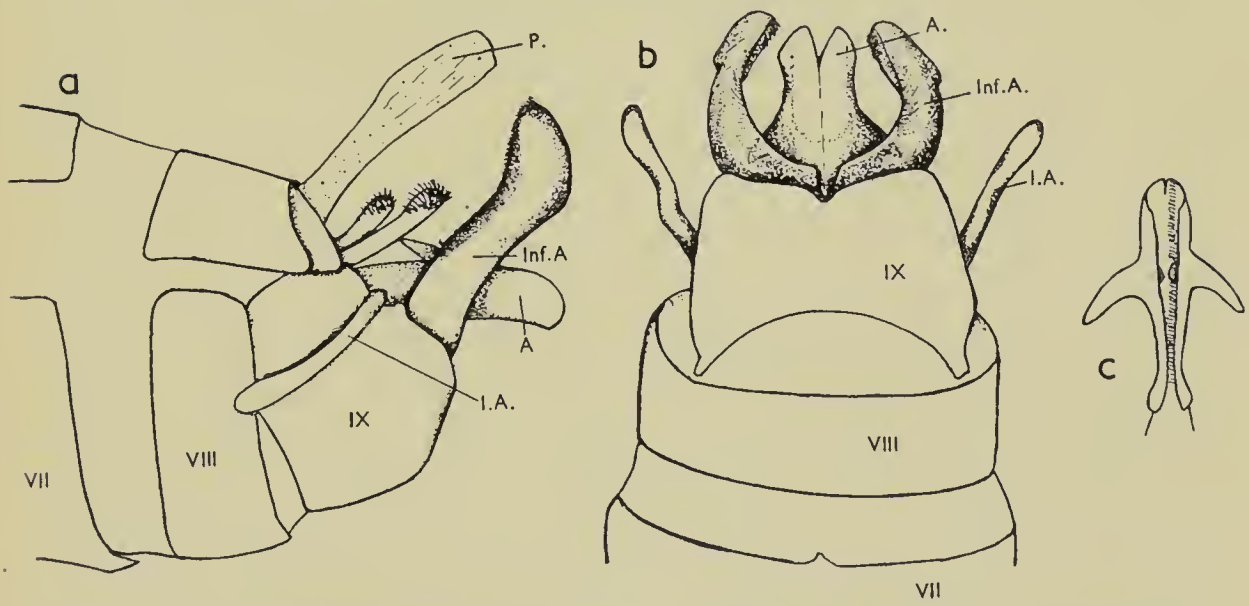

FIG. 357.—*Hydrobiosis clavigera* McFarlane. ♂ genitalia. *a*, lateral (intermediate appendage folded back) ; *b*, ventral ; *c*, aedeagus, dorsal, apex showing lateral processes.

" Holotype and paratypes in Canterbury Museum."

" Habitat, very small, cold streams in mountain gullies, 1500 to 3000 ft. in Waimakariri Basin."

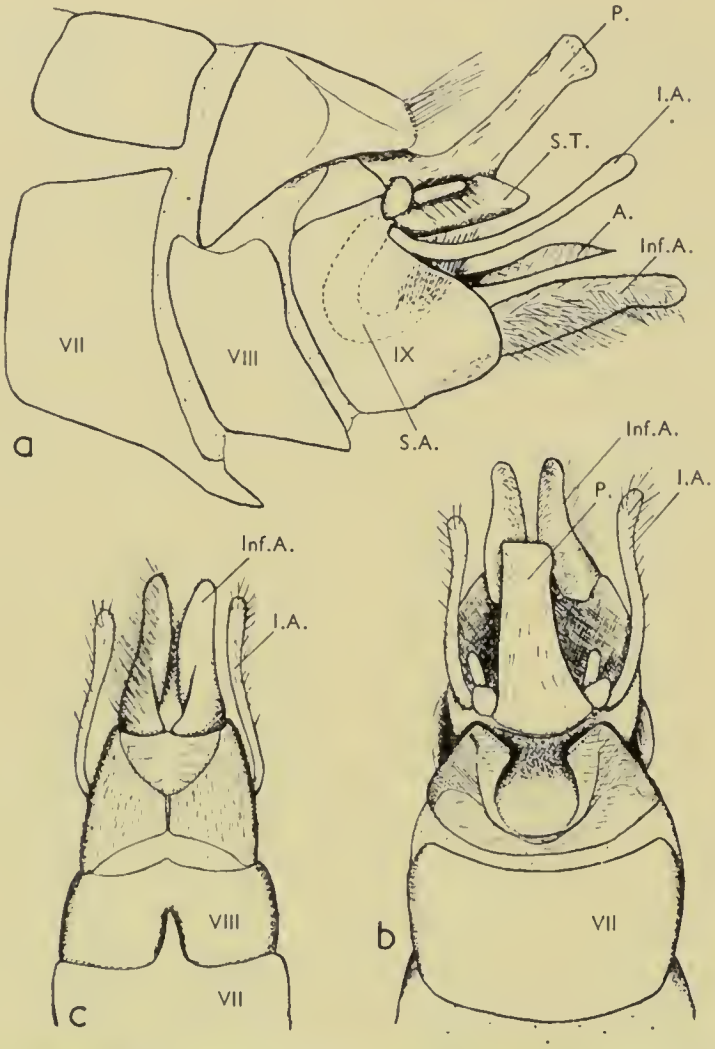

FIG. 358.—*Hydrobiosis charadraea* McFarlane. ♂ genitalia. *a*, lateral; *b*, dorsal; *c*, ventral.

Hydrobiosis clavigera McFarlane (fig. 357).

Hydrobiosis clavigera McFarlane, 1951, *Rec. Canterbury Mus.*, 5 : 259, pl. 59, figs. 16–18.

" Expanse, male 16 to 18·5 mm.; female 20 to 22 mm."

" A dark grey insect, the forewings mottled with lighter shades. Male spurs apparently 1 4 4, female 2 4 4, the front pair very small and equal."

" Male abdomen, a minute tooth on antepenultimate sternite; inferior appendage, long, simple, from the side view like thick curved clubs and viewed from below like arched callipers; intermediate appendage clubbed, shorter than inferior appendages; superior appendages bifid from the base, the upper branch shorter, each branch terminating in a tuft of stout bristles; aedeagus conspicuous, stout, distal part in

the form of an incomplete tube open dorsally and having two backwardly directed flukes (fig. 357*c*) ; a pair of curved dagger-shaped parameres."

" Female abdomen, small broad tooth on antepenultimate sternite, smaller tooth on penultimate sternite ; ultimate sternite having wide free edge posteriorly, on each side of which at about quarter way across is a sharp incision."

" Holotype, allotype and paratypes in Canterbury Museum."

" Habitat : fast, cold, stony streams from sea-level to a little over 2000 ft. Widely distributed through both islands."

Hydrobiosis charadraea McFarlane (fig. 358).

Hydrobiosis charadraea McFarlane, 1951, *Rec. Canterbury Mus.*, 5 : 259, pl. 59, figs. 18–21.

" Expanse, male 18·5 to 20·5 mm.; female 21 to 24·5 mm."

" Head and prothorax brown to fuscous ; antennae brown distally, ringed lighter basally ; spurs, male 0 4 4 and female 2 4 4 ; neuration of forewings strong, each vein having lengths of light and darker colour : strong hair on veins similarly coloured : tibiae and tarsi brown dorsally, ringed with narrow light bands."

" Male abdomen viewed dorsally (fig. 358*b*), a deep circular excision posteriorly, from within which rises the proctiger ; tufts of hair are directed backward from each side of this excision ; a spur-like tooth on the antepenultimate sternite (fig. 358*c*), and a soft area posteriorly on the ultimate visible segment ; inferior appendages peg-like, very hairy on outer surface, strong brown spines on inner surface : intermediate appendages slightly clubbed : superior appendages in the form of U-shaped rods with brushes of stout bristles distally : at the base of the proctiger, ventrally, are a pair of elongate sclerotised tubercles : between the latter and the intermediate appendages, on each side is a small tubercle and a truncated rod : aedeagus simple."

" Female antepenultimate sternite with long tooth, more than half the length of the sternite, the ventral surface of the tooth with dark hair ; similar hair on broad short tooth of penultimate sternite ; posterior margin of ultimate sternite in the form of three flat arcs, the middle one being the largest."

" Holotype, allotype and paratypes in the Canterbury Museum."

" Habitat : mountain streams from 2000 to 5000 ft., Waimakariri Basin."

Hydrobiosis styx McFarlane (fig. 359).

Hydrobiosis styx McFarlane, 1951, *Rec. Canterbury Mus.*, 5 : 260, pl. 60, figs. 22–24.

" Expanse, male 23·5 mm.; female unknown."

" Eyes dark, head light brown dorsally, light and dark brown hair intermixed : hair on antennae very short and of similar colour to antennae so that the ringed appearance is not very well marked. Thorax light brown. Forewings between light brown and straw colour, the hair of a similar colour short, fine, lying close to the membrane, more dense in the distal half : upstanding dark hairs at end of A1, and basally on M and Rs : venation strongly marked. The hind wing is hyaline, the fringe almost non-existent except in the anal area. The limbs are uniform light brownish yellow in colour, spurs 2 4 4 all large and dark."

" The abdomen is light in colour, the genitalia conspicuous and somewhat like that of *H. spatulata*. There is a fine process on sternite seven. Segment eight is strongly built, the sternite and tergite apparently fused in the pleural region : the sternite is extended backward in a rounded free margin which has a strong fringe

of hair. Dorsally, tergite eight is cleft its full length by a U-shaped softer area, the posterior shoulders of which are raised a little and carry tufts of hair. From the posterior margin of sternite nine rises an opaque spatulate process with the texture of a fine rasp dorsally. Below this is a soft groove in the sternite. Dorsally the

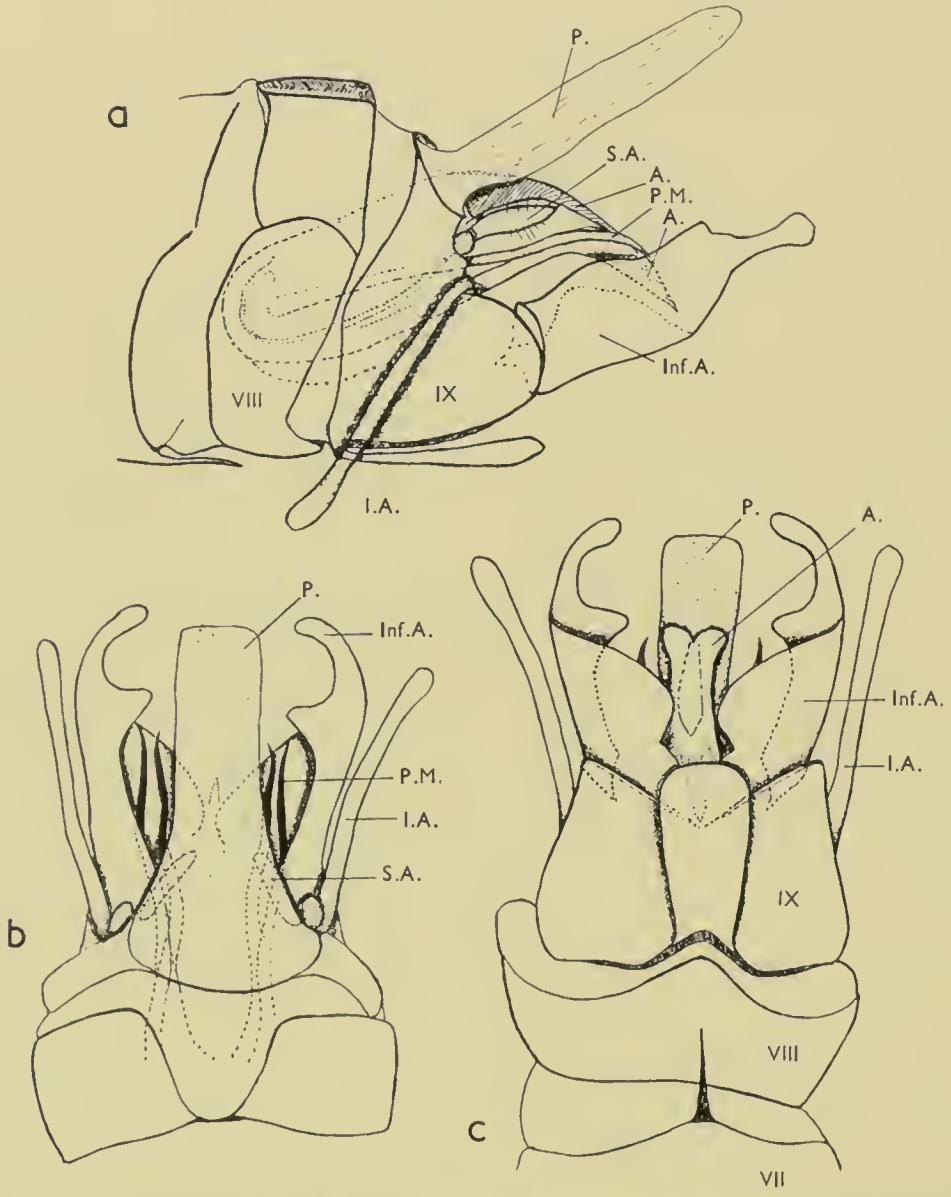

Fig. 359.—*Hydrobiosis styx* McFarlane. ♂ genitalia. *a*, lateral (intermediate appendage folded back); *b*, dorsal; *c*, ventral.

tergite reduces to a line posterior to which rises the proctiger. The superior appendages are small, converging below the proctiger and not easily seen without manipulation of the parts. The intermediate appendages are long, very slightly thickened distally and having a few light hairs. The inferior appendages are crescentic in cross-section in the large proximal part, extending distally to a fine slightly clubbed end. Viewed from below they appear to end in two processes (fig. 359*c*). The ventral

surface is thickly clothed in the basal part with short strong setae following the contour of the surface towards the mid-line. Distally the hair is principally on the ventral edge of the appendage. In the similar species *H. spatulata* the inferior appendage is, by contrast, very hairy. The aedeagus dorsally divides into two long brown needle-like processes alongside which lie similarly curved parameres. The ventral process of the aedeagus is bifid distally (fig. 359*c*)."

" Type, male, unique, in Canterbury Museum. Abdomen mounted. Collected by S. Lindsay, 9.1.37."

" Locality, Brooklands (probably from Styx R.)."

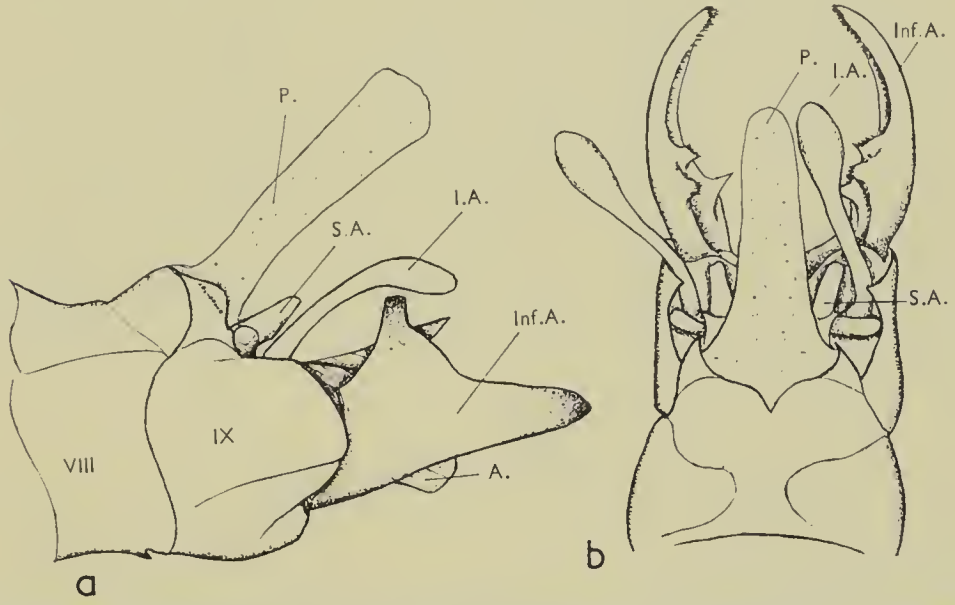

FIG. 360.—*Psilochorema leptoharpax* McFarlane. ♂ genitalia. *a*, lateral; *b*, dorsal.

Psilochorema leptoharpax McFarlane (fig. 360).

Psilochorema leptoharpax McFarlane, 1951, *Rec. Canterbury Mus.*, 5 : 261, pl. 60, figs. 25, 26.

" Male expanse 19 mm."

" Very uniform in size. Very similar to the genotype, but slightly narrower in the forewing which is finely and evenly mottled with light and dark hair over the whole surface. There are no patches of golden hair. The arrangement of patches of upstanding hair on the veins of the proximal part of the wing is much the same as in *Ps. macropharpax* but the hairy tufts are not so large. The white area about the end of A1 connects basad with another approximately equal area in the middle of the wing. Around this latter white area are three areas of closely adpressed, dense, short, black hair, arranged as follows : the largest between Rs and M : the second much smaller, continuing from the first on the other side of the white area, and the third, below the white area between Cu1 and Cu2."

" Male inferior appendages broad at base, sharply tapering, curving inwards distally; sparse hair : a small process dorsally near the base : stout short spines on the inner surface round the edge, denser at the tip, and at two points dorsally

towards the base. Intermediate appendages stouter than in genotype. Superior appendages short and blunt."

" Holotype male and paratypes in Canterbury Museum."

" The larvae of this insect are very plentiful in the gravelly bed of the Waimakariri River from sea level to 2500 ft."

Psilochorema bidens McFarlane (fig. 361).

Psilochorema bidens McFarlane, 1951, *Rec. Canterbury Museum*, 5 : 262, pl. 61, figs. 29, 30.

" Male expanse 19 mm."

" Similar to genotype but having less contrast in colour in the wing mottling. There are no patches of white of any size, white hair being present in the form of irregular dots and lines. Upstanding hairs sparse and small. No patches of golden hair and in many specimens the colour is indistinct and the hair sparse and short."

" Male inferior appendage viewed from the side is rectangular with a spur rising dorsally from the base : a small nob or tooth distally on the dorsal edge, armed with black spines inwardly, a second patch of spines ventral to the above, at the apex : viewed from above the two patches of spines give a two-toothed appearance. The dorsal process of the appendage is roughly T-shaped, the dorsal element being the longer. Intermediate appendages more clubbed than in genotype : superior appendages flattened, triangular, smaller and narrower than in genotype. This species is found in slower streams, not subject to torrential floods, such as Sloven's Creek and the Grasmere, at Cass."

" Type in Canterbury Museum."

Notiobiosis shandi (McFarlane) (fig. 362).

Percivalia shandi McFarlane, 1951, *Rec. Canterbury Mus.*, 5 : 263, pl. 62, figs. 33.34.

" Expanse 20·6 mm, male."

" This species is the fifth recorded of the genus Percivalia McF. This insect is dark brown, superficially very like *P. fusca* McF., but differentiated clearly by the genitalia which is large and elaborate. The terminal sternites have much the same margin posteriorly as *P. banksiensis* McF., that is, a broad peg-like process, almost transparent on the ultimate sternite, a broadly rounded process on the penultimate, and a sharp, narrow process on the antepenultimate. Inferior appendages, viewed from the side, are very little tapered, and curve downwards to the point : from below they are broad on the basal half which is evenly rounded and merges from a crescentic section basally to a rounded section distally, intermediate appendages long, slightly clubbed distally ; the superior appendages slope down basally before turning sharply to the rear : the aedeagus consists of a long ventral arm curving up to the proctiger, and forked distally, and a short thick dorsal arm which can be seen clearly in a prepared specimen : the long, dark, stout parameres have a short prong at about one-third of their length from the point."

" Holotype male, unique, in the Canterbury Museum. Abdomen in balsam."

" Locality : Port Ligar, Pelorus Sound, December, 1945."

Notiobiosis borealis (McFarlane) (fig. 363).

Percivalia borealis McFarlane, 1951, *Rec. Canterbury Mus.*, 5 : 264, pl. 75, figs. 1–3.

" Expanse, male 19 mm.: female unknown."

" This is the sixth species so far recorded for this genus and the first record of the genus in the North Island."

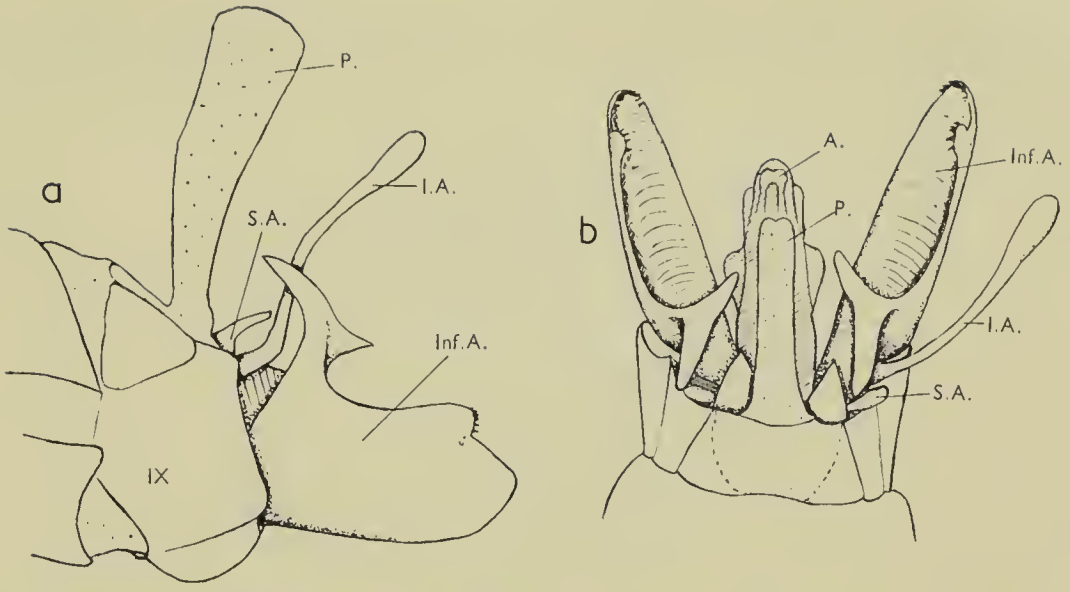

Fig. 361.—*Psilochorema bidens* McFarlane. ♂ genitalia. *a*, lateral; *b*, dorsal.

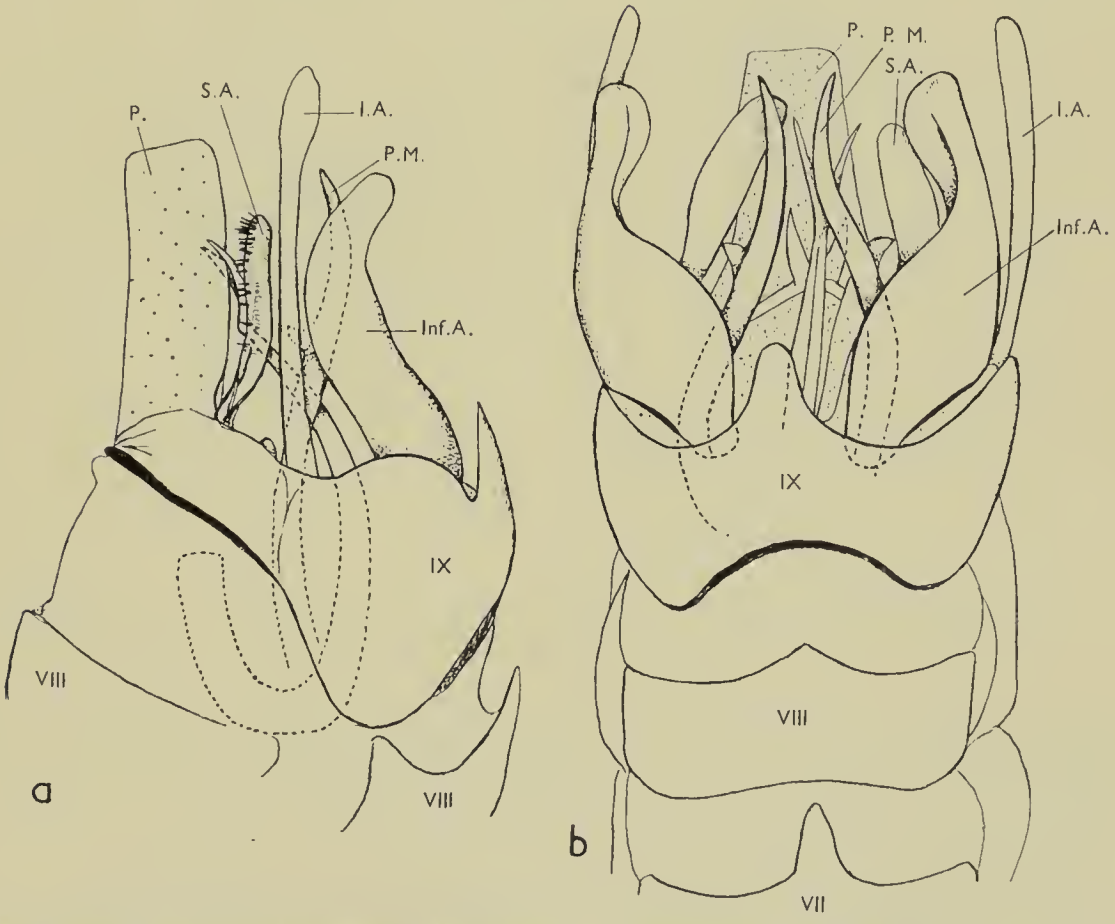

Fig. 362.—*Notiobiosis shandi* (McFarlane). ♂ genitalia. *a*, lateral; *b*, ventral.

"In general appearance this species differs from others of the genus in the greater width of the wing at the tornus and in the more acute apex and brighter colour of the forewing."

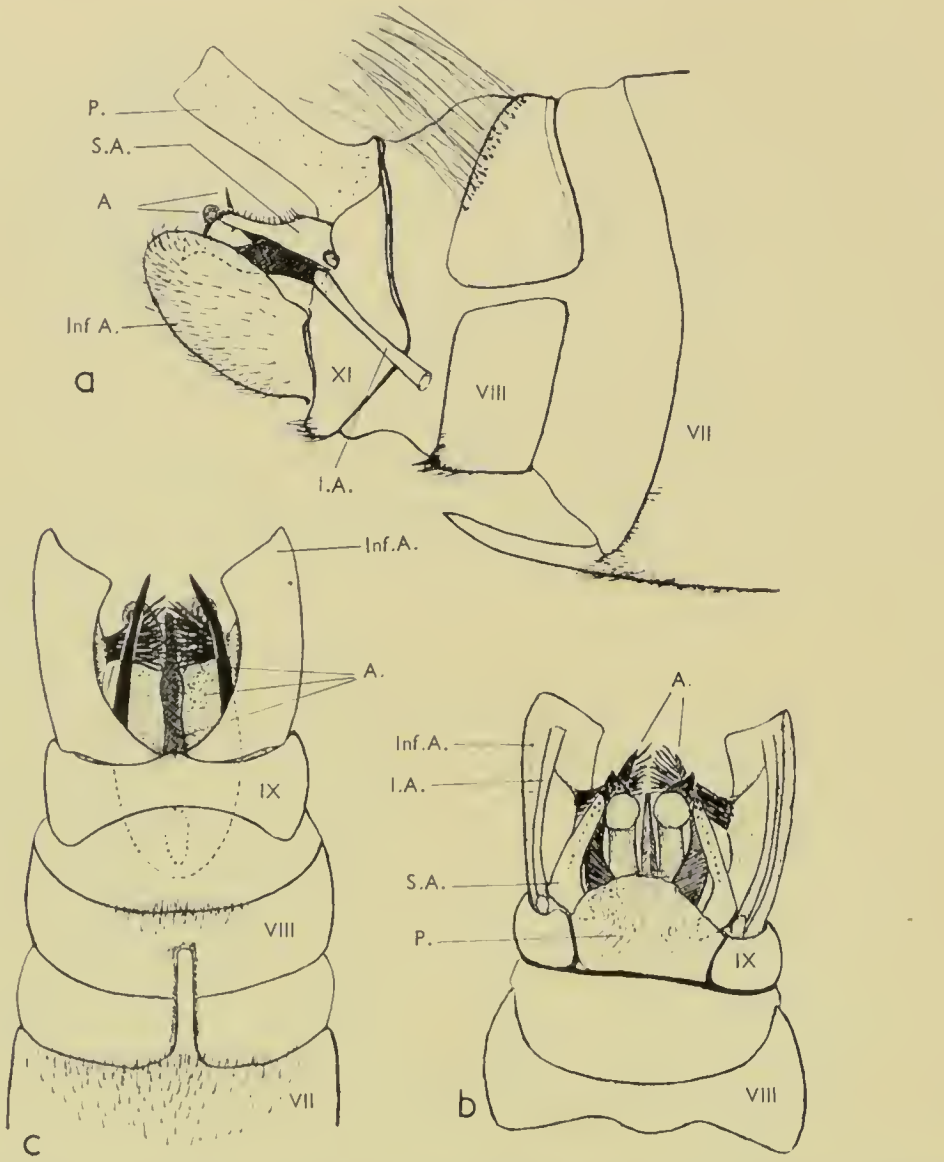

FIG. 363.—*Notiobiosis borealis* (McFarlane). ♂ genitalia. *a*, lateral (intermediate appendage folded back); *b*, dorsal (proctiger turned up); *c*, ventral.

"Head light brown, oculi dark, ocelli very light, a dense tuft of long, coarse golden brown hair on the frons, the two tubercles, and the occipital ridge: antennae light yellowish brown. The pronotum and tergulae have hair similar to that on the head, while that on the mesonotum is finer and more sparse. The forewings are a light reddish brown with yellow flecks, the largest group of which begins at the distal end of the pterostigma and curves in a line roughly parallel with the apex but more obtusely. The pterostigma is very dense. A few upstanding hairs on the veins of the basal third of the forewing, the membrane covered evenly by fine hair

lying close to the surface. This hair is a bright reddish brown except on the lighter flecks where it is golden. There is no hair on the termen of either wing, possibly the result of damage. The legs are light straw colour ; the spurs 2 4 4, those of the forelimb unequal."

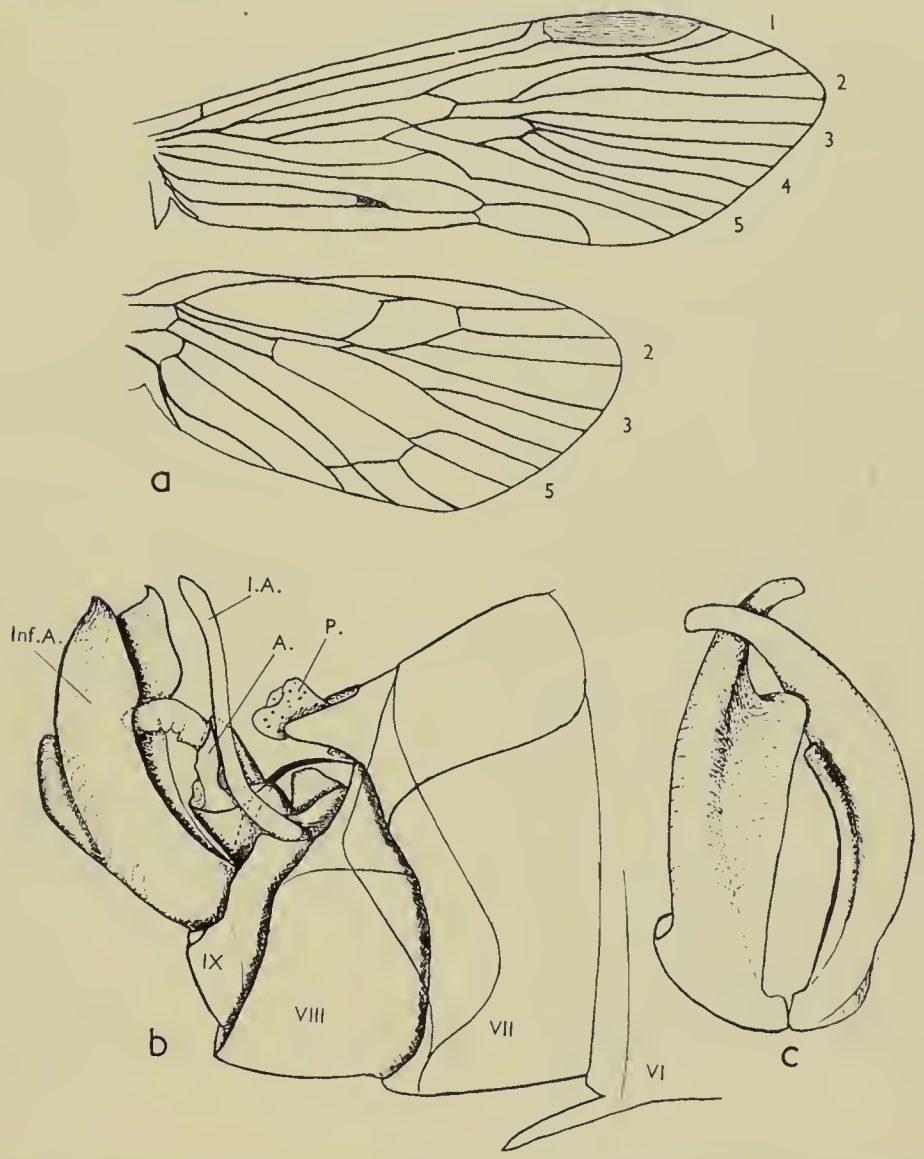

FIG. 364.—*Neurochorema armstrongi* McFarlane. ♂. *a*, wings ; *b*, genitalia, lateral ; *c*, inferior appendages, ventro-lateral.

" The abdomen and inferior appendages are a light straw colour. Two openings occur between the second and third tergites : there is a long spine on the seventh sternite. The inferior appendages, viewed from the side are similar to broad paddle blades, the outer surface with fine sparse hair, the inner surface with a tuft of dark, massive setae, bent at the ends which meet from opposite sides. A projection on the ventral edge, distally, gives the appendage a truncated appearance when viewed in the dorso-ventral plane. The intermediate appendages in this specimen have lost

their ends. They are fine, and distend distally. The superior appendages, viewed from the side, have a straight lower edge, a rectangular basal part from which the upper edge curves to the tip. This curved edge is set with spines, the outer ones being short and thick. Viewed dorsally the appendages taper and point inwards. The ventral projections of the aedeagus are dark brown and ventrally have a foot-like tip. Viewed from above or below they appear to taper to a sharp point. The filum passes dorsally between two projections from the aedeagus, each of which has a globular end from which a dark brown tip twists ventrally. Viewed laterally this part is like a miniature bird's head. The proctiger, in the type appears to have had part of the end cut off."

" Type, male, unique, in Canterbury Museum : abdomen in balsam. Taken by E. Bray, 1/9/49."

" Locality : Titirangi, Auckland."

Neurochorema armstrongi McFarlane (fig. 364).

Neurochorema armstrongi McFarlane, 1951, *Rec. Canterbury Mus.*, 5 : 254, pl. 62, figs. 35–37.

" Expanse ♂ 19 mm."

" This insect is very like the genotype *N. confusum* McL. Superficially it looks like a large form of *N. confusum* but is more robust, hairier in the forewings and differs in neuration and genitalia. A diagnostic feature of *N. confusum* is the coalescence of M2 and M3 basally to form an apparent apical fork. In *N. armstrongi* (fig. 364*a*) M2 and M3 are close basally but instead of coalescing, are joined by a cross-vein closing the median cell. Other points of similarity with *N. confusum* are the atrophy of Rs, and the presence of three apical forks in the hindwing."

" The abdomen (fig. 364*b*) has a long fine tooth on the sixth sternite. The proctiger which is very short rises from a deep cleft dorsally."

" In the male the inferior appendages (fig. 364*c*) are large, testaceous, curving inwards and crossing at the tips. The ventral edge is in the form of a flap-like extension from the main body of the appendage. The intermediate appendages are slender and little clubbed : as in the genotype there are no superior appendages. The aedeagus is stout with a curved filum."

" Holotype, ♂, unique, in Canterbury Museum."

" Abdomen in balsam."

" *Locality* : Waitahanni River, North Island."

" This insect is from the collection of Dr. J. S. Armstrong of Taupo after whom it is named."

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